

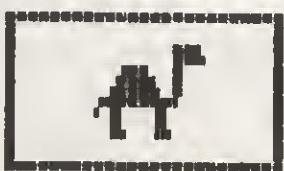
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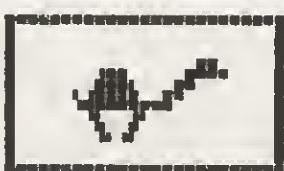
No S802207

Vol. 4, Issue 2, September 1983

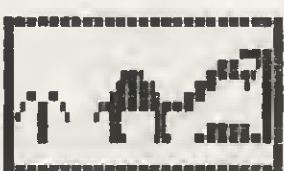
DESERT CHASE for Level II



YOUR CAMEL
LIKES THIS PACE



YOUR CAMEL IS
BURNING ACROSS
THE DESERT SANDS
WARNING —
YOU NEED A DRINK



YOU HAVE ARRIVED
AT A WATERHOLE...
YOUR CAMEL EATS
HAPPILY WHILE YOU
REFILL YOUR
WATER-BAG

Also in this issue:

DEPARTMENTS:

Conserving BASIC Memory
A Bit of Lower Case

PROGRAMMING:

Theory and Techniques of Sorting — Part 8

SOFTWARE:

- Formation — Level II
- Othello — Colour
- Ordering Priorities — Level II
- Register Display Program — Peach
- Towers of Hanoi — Colour

• TRS-80 • SYSTEM 80 • VIDEO GENIE
• PMC-80 • HITACHI PEACH
• TRS-80 COLOUR COMPUTER

***** ABOUT MICRO-80 *****

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MICRO-80 is an international magazine devoted to the Tandy TRS-80 Model I, Model III and Colour microcomputers, the Dick Smith System 80/Video Genie and the Hitachi Peach. It is available at the following prices:

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**** CONTENT ****

Each month we publish at least one applications program in 8ASIC for each of the microcomputers we support. We also publish Utility programs in 8ASIC and Machine Language. We publish articles on hardware modifications, constructional articles for useful peripherals, articles on programming techniques both in Assembly Language and 8ASIC, new product reviews for both hardware and software and we print letters to the Editor.

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MICRO-80 is Registered by Australia Post - Publication No. SBQ2207

AUSTRALIAN OFFICE AND EDITOR:

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GPO WOODWARD, SOUTH AUSTRALIA, 5034.
TEL. (08) 211 7244

U.K. SUBSCRIPTION DEPT:

24 WOODHILL PARK, PEMBURY,
TUNBRIDGE WELLS, KENT TN2 4NW

Printed by:

Shovel & Bull Printers,
379 South Road,
MILE END, S.A., 5031

Published in Australia by:

MICRO-80
433 Morphett Street,
Adelaide, SA., 5000

***** EDITORIAL *****

With the announcement of a new range of computers, Tandy Australia offers something to interest everyone from the MC-10 Micro Colour Computer for \$199.95 (available in November), through the new Model 4 to the Models 12 and 16. There's even a portable computer for the travelling businessman.

The word 'portable' takes on a new meaning with the Model 100 which is about the size of its own manual but lighter. It has a LCO display of 8 lines of 40 characters (with graphics capability) and is battery powered with a non-volatile memory. The basic hardware consists of a good keyboard, 8K of RAM (expandable to 24K), a clock with calendar, and interfaces to accommodate a Centronics printer, a RS-232-C port and a cassette recorder for data storage. The 32K of ROM provides a 8ASIC interpreter, a word processor, an address and appointment facility and communications software. Once you become familiar with these, I image that you can take and use the Model 100 literally anywhere.

The new Model 4 will be available in three configurations - 16K cassette (for \$1,799), 64K single drive (for \$2,799) and 64K two drive (for \$3,299). Model 3 owners can upgrade their computers with a kit that includes a new keyboard, a new CPU board with 64K memory and the TRSOOS 6.0 operating system with Oisk BASIC and sells for \$1,299. CP/M Plus for the Model 4 is expected within two to three months.

Meanwhile, in the U.S. Tandy has released a new, smart-looking 64K Colour Computer (featuring a good quality keyboard) and the OS-9 real-time, multi-tasking, multi-user operating system providing access to a broad range of existing applications software. The Multi-Pak Interface (priced around \$US180) is an accessory allowing the Colour Computer user to select one of four ROM packs at the flick of a switch or under software control. Undoubtedly these too will be available in Australia in the near future.

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***** PEEKING (UK) - by Tony Edwards *****

You will remember the universal programming language NOS-8ASICOOE reported in an earlier issue of MICRO-80. Rather than die, this language is still developing and the latest development is NOS-BASICOOE-2, which includes the earlier version. These programming languages have their origin in the Dutch Broadcasting Corporation's program "Hobbyscoop" (pronounced Hobby Scope). Programs on computing, including the transmission of programs in 8ASICOOE are output regularly by Radio Hilversum 2 and 4 on the medium and VHF wave bands for reception in Holland, but these are easily received in other European Countries.

For our readers in other parts of the world short-wave transmissions were tried but were not successful. However, the programs are now transmitted to radio stations world wide for re-transmission locally. The program to look for is "Radio Activity", a 15 minute English language program which is re-transmitted for local reception in Australia, USA, Canada, and parts of Africa and Asia, as well as Europe. The local stations broadcast at suitable local times but the internal Dutch program is transmitted at 1710 GMT on Sundays in the summer, and at 1810 on Sundays in the winter. It will be found at 747kHz (401 metres). Good listening! The main program is in Dutch but it includes short explanations in English.

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***** INPUT/OUTPUT *****

From: John Veldthius - Taranaki, N.Z.

Let me first say what a fantastic magazine you have. Now for my question. I have bought the adventure game called Asylum and have been going nutty for the last two months. I am stuck in the first maze and cannot find any way out. I have read the hints in Vol. 3, Issue 11 (October 1982) but these have been of no help at all. I have mapped the maze so far but still can't find anything else.

Please help as I may end up in the "Institute" at this rate.

From: Steven Bauer - Upwey, Vic.

These are questions which, hopefully, you will answer or, if not, maybe one of your other readers will be able to help.

Asylum - how do I get out of the first maze; please explain each and every step.

To Brian L. Hill - Where did you buy the components? (for the 32K mod). Dick Smith's price is over \$23.

From: Nick Lambropoulos - Mildura, Victoria.

It's getting a bit monotonous, I know, but I'm hoping, before everyone packs up and forgets about Asylum (?), which is usually widely talked about nowadays. I CRY OUT one final time for someone to tell me whereabouts the matches could be found in the Asylum, if it's not too much trouble. I'm also having trouble figuring out what the hint means in the Guru's room and what is in the other Dark Room. I would appreciate any help given. Keep up the great work, Micro-80.

From: Jeremy Terhoeve - Townsville, Qld.

Please can anyone tell me how to get past the gorilla in the second maze of Asylum? I cannot fully understand the hint the program gives here. Do you need a special object?

(To answer these questions, we need to refer to a professional by the name of Ron Hack who was glad to help by providing specific answers. Thanks very much, Ron. -Ed.)

From: Ron Hack - Reynella, S.A.

To assist those readers still seeking clues for the "Asylum" adventure and to refresh my own memory, I decided to play the adventure again and answer the questions asked as I proceeded. Here goes -

GENERAL HINTS:

As you are aware, the adventure must be completed within a certain time. If you wish to take a break during the game (for a cup of coffee or to write some clues for a magazine) call up the vocabulary as this stops the clock.

To John Veldthius, Taranaki, N.Z.

On a large blank piece of paper draw light pencil lines across and down the page equal spaces apart, making a grid. As you proceed to move down the passages draw heavy lines marking the walls as if you were looking down from above. Remember you will hyperspace in certain places and dropping things along the way will help you to sort out where this occurs.

To Steven Bauer, Upwey, Vic.

It is impossible to give step by step instructions on getting out of the 1st maze (it would take up too much magazine space and possibly spoil the adventure for others).

Hints: - You will need to find a key
- Murderers can read
- There are eight different corridors off the revolving doors and not four as I thought for a long time.
- Having mapped all the maze you should find it forms a rectangle.

To Nick Lambropoulos, Mildura, Vic.

The hint in the Guru's room is in Latin (so I've been told) and translated roughly means - In the dark, horses look like cows (and, as we know, donkeys look like horses). This tends to mean something once you meet the inmate outside the room full of water. Having met this inmate I suggest you try some trading.

The matches are in the 2nd maze but you will have to solve the mystery of the 20 room corridor before you find them. Refer to earlier clues (MICRO-80 Oct. '82).

As to the other dark room and its contents - if you are curious try lighting a match to find out.

To Jeremy Terhoeve, Townsville, Qld.

You do need an object to help you pass the gorilla in the 2nd maze and you'll find it in that maze. You also need an object you are already carrying assuming, of course, you have not dropped something since entering 2nd maze. The hint given at this stage of the adventure is a good clue as to what object may help you.

To Grant Barnes, Moe, Vic.

You are wasting your time looking for the Professor's Office unless you are up to this stage of the adventure. For what it's worth, the office is in the final small maze and when you reach that stage you will find it easily enough.

Well, that's it for now. I'll just get in this strange contraption and.....WHEEEE - I wonder where I'll land!!

DEPARTMENTS

***** KALEIOOSCOPE *****

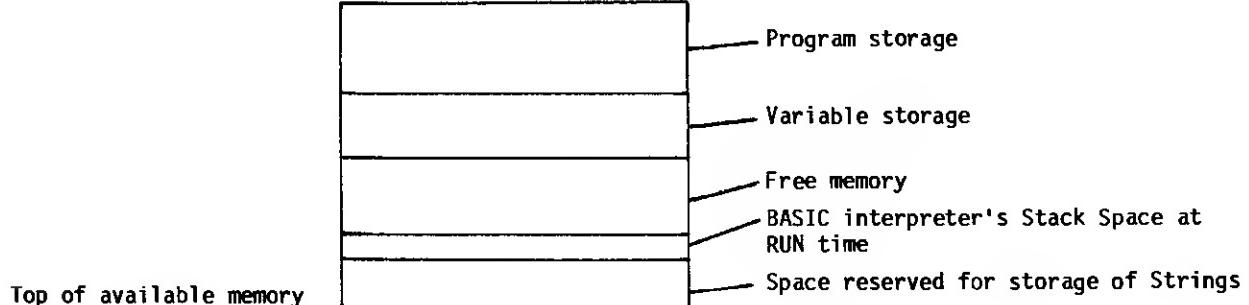
In this month's issue we publish for the first time a program for the Colour Computer (*Othello*) submitted by one of our readers and we look forward to bringing you more programs from our readers that show how they use their computers and how to improve your programming skills and your knowledge of the Colour Computer. Towers of Hanoi - an interesting puzzle for you to try on your computer - demonstrates the use of recursive programming in BASIC and is worth looking at more closely. For those of you who cannot find the time to type in the programs from the magazine listings, and would prefer an easier method, we have good news - the Cassette Edition of the magazine, commencing with this issue, will include all the Colour Computer programs contained in that issue! The cost of the magazine, plus cassette subscription will be \$65 for 12 issues and single cassettes will be available for \$4.00 each.

Most of the Level 2 programs that we have converted are intended to run on a 16K Colour Computer with Extended Colour BASIC, but we seem to have slipped up with one of these quite unintentionally. Here at MICRO-80 our Colour Computer consists of a 32K Extended Colour BASIC machine with one disk drive. The Level 2 programs are transferred, edited to remove the reserved words not used in Colour BASIC and to accommodate the smaller 32 x 16 display, and then tested on this machine. In most cases, what was a 16K Level 2 program works fine on a 16K Colour Computer, but in the case of "Sink the Enemy Navy", the memory required to run the program crept just over the 16K. How can you get a program to use less memory? Read on to find out.

BASIC PROGRAM MEMORY USAGE

To run a BASIC program, four well-defined and distinct uses are made of the available memory in your machine. These are illustrated in the following diagram:

Bottom of BASIC memory



BASIC MEMORY USAGE

When you type in your BASIC program, the lines are tokenized to conserve memory and stored in the program storage area. However, if the program is to run successfully (assuming there are no programming or syntax errors) sufficient memory must be available for storing program variables, String storage and the BASIC stack, otherwise the program will stop during execution with an Out of Memory or Out of String Space error (the BASIC interpreter constantly checks the amount of free memory and, if it falls below a certain lower limit, terminates the program with an error).

REDUCING MEMORY REQUIREMENT

When a program halts with an OM error, the answer is not necessarily to rush out and buy more memory (an expensive solution but one almost guaranteed to work). You can overcome the problem by making more efficient use of your available memory by a combination of the following methods. Naturally, there are compromises in some of these and a few violate what is known as "good programming practice" but I think that under these circumstances the end justifies the means.

1. Program Storage

Comments within a program are ignored by BASIC and serve only as documentation for the programmer. If you run out of memory, start by removing all comments from the program (but keep a backup copy with the comments for future reference). However, be careful that you do not introduce other errors by doing this. For example, consider the following program segment:

```

20 REM CHECK KEYBOARD
30 A$=INKEY$:....etc.
.
100 GOSUB 20

```

Deleting the remark line 20 will produce an error at run time since line 100 references a non-existent line number. Line 20 can be deleted but line 100 must also be changed to GOSUB 30 to produce the desired effect.

Each BASIC line incurs a 5 byte overhead for the interpreter's use. By placing several statements on one line you can save a good deal of memory in the program storage area. For example, the following portion of the program "Sink the Enemy Navy" could be rewritten to use much less memory:

```
30 DIM C(14,9)
40 DIM B1(5)
50 DIM B2(5)
60 DIM C1(5)
70 DIM C2(5)
80 DIM O1(5)
90 DIM O1(5)
100 DIM S1(5)
110 DIM (S2(5))
```

can be replaced by:

```
30 DIM C(14,9), B1(5), B2(5), C1(5), C2(5), O1(5), D2(5), S1(5), S2(5)
```

The total memory saved amounts to 40 bytes, not to mention the slightly faster execution time!

2. String Storage

The amount of string space used and the amount required by a program are not necessarily the same. However, there is good reason for allocating a generous amount of string space. During program execution the interpreter makes use of string space somewhat extravagantly. To illustrate, suppose A\$ consists of the first 25 letters of the alphabet and you want to append the letter "Z". You can do this with the statement A\$=A\$+"Z". What actually happens in the String Storage section is that the first string of 25 characters is discarded as garbage and a new string of 26 characters is created and stored. If the amount of the string space is exhausted, the interpreter begins a "garbage collection" routine. Frequent use of this routine slows down program execution speed. The moral of the story is that if you can afford to be extravagant then allow a generous amount of string space in your CLEAR statement, but if memory is scarce, use only what is required.

3. Variable Storage

Each time a new variable is used within a program additional memory is used in the variable storage area. When writing a large program you can be reasonably certain that it will use most of your available memory. It would be wise to consider your total variable requirements (both in number and in use) at the outset and try to use as few as possible to conserve memory and improve the execution speed of the program. As a general rule, try to re-use existing variables whenever possible because each new variable used within a program consumes some memory for the duration of the program, even if it is used only once. It is much easier to consider these needs in the initial stages of program development than it is to make extensive changes to variables in an almost complete program.

There are occasions where the creation of a new variable can actually be used to save memory. To illustrate, suppose your program uses the number 20000 frequently, say, for example twenty times in different parts of the program. You can save a substantial amount of memory (about 80 bytes) by assigning V=20000 at the beginning of the program and using the variable V in place of the number 20000 elsewhere in the program. Not only does this save memory, but as a bonus, it increases the speed of the program and saves some typing as well.

IN SUMMARY

The place to start when you're trying to save some memory is within the program storage area. More often than not, you can free enough memory here to use the program effectively without having to resort to more drastic measures. If you must economize in variable usage and string space allocation, then perhaps the option of increasing your amount of physical memory should be considered. There are other ways to conserve memory such as abbreviating instructions and messages, or deleting parts of the program that you can do without, but these are more a matter of personal taste rather than techniques of programming. So if you've been frustrated by some large program that just wouldn't fit your 16K Colour Computer, try trimming some of the fat!

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***** PEACH BOWL *****

Many who are new to BASIC find programming in that language difficult and the idea of programming in assembly language (or machine language) seems totally out of the question. This month we present "Register Display" which is a reasonably short machine language utility that, apart from being useful, may serve to teach you a little about this low-level programming language. When you wish to learn how to program in machine language the place to start is with a good book that explains the fundamentals and the instruction set of the processor you're using (in this case, the Motorola 6809). A good example is the book "Programming the 6809" by Rodnay Zaks which tends to be less formidable than Motorola's own publications. The Peach provides

an adequate machine code monitor that will allow you to develop and test short m.l. programs that you have assembled by hand.

For those of you who like puzzles, we have a version of "Towers of Hanoi" for the Peach that should keep you amused for hours. The original puzzle would take innumerable lifetimes to solve, but this version is somewhat abbreviated. And good news for those of you who cannot find the time to type in those long magazine listings - our cassette edition now includes the Peach programs published in that issue of the magazine, commencing with this issue. The prices for cassettes will be the same as shown inside the front cover - \$4.00 for a single cassette and \$65.00 for a subscription that includes magazine plus cassette.

SECTOR EDITOR CORRECTION

If you had any problems with this program after making the amendments published last issue, then perhaps this correction may solve that problem:

Change

60130 DATA 36,30,10,C6,0F,34,...

to

60130 DATA 36,30,10,C6,10,34,...

Geof Orury, who developed the amendments to Sector Editor, also passed on this correction.

The discussion on conserving memory in Kaleidoscope will also be of interest to new Peach users. (The Peach too uses a Microsoft BASIC interpreter). In the case of the Peach, it may be added that although the use of long variable names does improve the clarity of a program, more memory is used to store the longer name and, in the case of very long programs, execution speed increases.

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***** GROUP ONE *****

While 'Desert Chase' and 'Ordering Priorities' are relatively straightforward Level 2 programs and should run in disk systems without changes, the machine language utility 'Formation' is definitely for Level 2 systems only as presented. For disk users, the changes required to use this utility with disk BASIC involve relocating the program (not very difficult if you have an Editor/Assembler), modifying the initialiser and using a different reserved word (such as NAME which doesn't appear to be used by some disk BASICs) and rewriting the I/O routines to make use of disk instead of cassette. We would be pleased to publish any adaptations developed by our disk system readers.

If you are a novice computer enthusiast, or even perhaps a more seasoned user, you may find the discussion on conserving memory in this month's Kaleidoscope of particular interest. All of the microcomputers that we support use a version of Microsoft BASIC and the information presented there is equally applicable to the Z80-based machines.

THE CASE OF THE LOWER CASE

At some stage in our relationships with our computers, many of us will take a step further inside the machine and begin to dabble with a hardware modification of some sort. More often than not, the apparent simplest of modifications will lead to a small hiccup that gradually grows to mammoth proportions the longer we struggle to overcome the difficulty. Mr. Wilson, one of our readers relates one such experience:

" I have installed a lower case modification as described in "THE CUSTOM TRS-80 & OTHER MYSTERIES" which was advertised and purchased through your magazine by a friend of mine. The mod was successful, because running the sample program gives me lower case letters.

Also running the short program as described in MICRO-80 November 1980 (Issue 12, page 10), enables me to type in lower case letters, so everything in this department seems okay.

Now the problem is if I try to load the MICRO-80 Lower Case Drivers (May, 1981) I get the message followed by four and a half lines of garbage on the screen, followed by the second prompt *? I type "/" then ENTER, the screen gives a flicker, it then sits there and does nothing. The writing stays on the screen and the only way to get any more keyboard action is to power down the computer.

So this brings me to a few questions. Oh! by the way, my computer is a

Level II 16K TRS-80 (cassette based) "G" board.

1. Is my tape faulty?
2. Is this mod compatible with yours?
3. If not, could you send me info on how to make it compatible?
4. If the tape isn't faulty and my mod is compatible with yours,
H - E - L - P!!!

Keep up the good work on the best magazine out for '80 users. Long live the '80!! "

What would you say is the problem? Of course, it had to be a faulty tape; we'll send the man a new cassette but, as it was late in the afternoon, that would have to wait until tomorrow. For some reason, which now escapes me, I decided to take the tape home and check it on my System 80 - a stupid idea, upon reflection, as my internal cassette deck of early vintage is extremely fussy and will fail any tape that has the slightest flaw. But, lo and behold! Each dump loaded perfectly!

More alarming than that was the fact that when executed, the results were exactly as reported by Mr. Wilson in his letter. For the record, my System 80 was fitted with a MICRO-80 lower case modification over two years ago and which has recently been replaced by a nameless brand because I now prefer an underline cursor. After thoroughly investigating the software aspect of this dilemma, which is where I assumed the trouble was, I took a long, hard look at the installation instructions and discovered to my surprise: NOT ALL LOWER CASE MODIFICATIONS ARE EQUAL!

The original design of the TRS-80 and System 80 used a video RAM block that was only seven bits wide with bit 6 missing. Instead, hardware was used to generate bit 6 from bits 5 and 7. The typical lower case modification involves the installation of an extra RAM chip for bit 6, a new character generator ROM (if required), a little bit of wiring on the board to enable bit 6 and a software driver to enable you to make use of the new lower case capability. I expected to find that when you write a zero into bit 6 of video RAM, you can read a zero from the same location (assuming that the chip is not faulty). A close look at the modification on p.108 in "The Custom TRS-80 and Other Mysteries" shows that what goes into bit 6 is not necessarily the data on the bus. With this modification you cannot store the values 0-31 in video RAM, even though it's now 8 bits wide.

As the MICRO-80 Lower Case Driver loads into video RAM (explaining the "garbage" which is really a machine language program) and executes from there to relocate itself to the top of memory, this situation is disastrous. No wonder the system hangs and needs to be powered down. The solution is to perform the other modification given in the same book on p.107 which simply connects the new chip to bit 6 of the data bus and allows video RAM to be used just like any other RAM. Try the following program to see what happens in the video RAM of your '80:

```

10 CLS:AD% = 15360
20 FOR I=0TO255
30 PRINT@896,"      ";
40 POKE A0%,I
50 IF PEEK(AD%)<>1 THEN PRINT@896,"IN=";I;"OUT=";PEEK(A0%);
60 FOR J=1TO200:NEXT J
70 NEXT I

```

In the top left-hand corner of the screen, the character corresponding to the value OUT is displayed and at the bottom you can see if your video RAM is 7 bits wide (able to store only 32 - 95 and 128 - 191), funny 8 bits (able to store only 32 - 255) or true 8 bits (able to store 0 - 255).

When it comes to hardware you must be careful not to make any false assumptions. If some problem develops then you must check very carefully the hardware changes and any software you are trying to use. It is interesting to note how, in this case, the combination of hardware and software led to such a subtle problem. To accommodate lower case ASCII characters, the video RAM must be able to store values in the range 32-127. Values in the range 0-31 (control codes) are not normally stored but are acted upon by the video driver routine. Therefore, this particular modification made no provision for storing control codes. In writing the universal Lower Case Driver routines, Eddy sought to provide maximum flexibility by allowing you to load them at any time without disturbing any other utilities or programs already in memory. The logical place to put them was into the video RAM and to relocate them from there to free high memory. So the MICRO-80 lower case modification provided a true 8-bit video RAM which would allow you to store a m.l. program which could be executed from there (making video RAM just like the rest of your RAM).

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***** FORM THREE *****

For our Model 3 readers, 'Desert Chase' and 'Ordering Priorities' are two Level 2 programs that

should run with no problems but the machine language utility 'Formation' will definitely not run without modification. However, changes similar to those described in the October '82 Model 3 Movie Microbug (p.20) should enable you to use this utility on your Model 3.

Why don't Model 1 machine language programs always work on a Model 3? The two main reasons are that the Model 3 ROM takes up more user RAM from 42E8H to 43E8H and that the Model 3 has an extra 2K of ROM to provide extra features. The extra ROM and different hardware architecture of the Model 3 required changes to the original 12K ROM found in the Model 1. This means that some ROM calls and entry points are different on the Model 3, preventing many Model 1 m.l. programs running on the Model 3. I compared the contents of the ROM in our Model 1 to that in our Model 3 for addresses in the range 0000-2FFFH and the results are set out below (Note that this may depend on the particular ROMs present):

0003 - 0004	01F1 - 01F1	124C - 1240
000E - 000F	01F3 - 01F4	1918 - 1918
0047 - 0048	01F8 - 020F	191C - 191C
0050 - 0062	0212 - 0231	1850 - 185F
0066 - 0070	0235 - 0245	206D - 2060
0082 - 0082	0247 - 025E	2073 - 2073
00AA - 00AA	0264 - 0282	2075 - 2075
00AE - 00AE	0284 - 02A7	2077 - 2088
0082 - 0084	02E2 - 02E4	208C - 208C
00C6 - 00C6	03C2 - 03E9	20F7 - 20F7
00EA - 00EA	03E8 - 0468	213B - 2138
00FF - 0101	046B - 0494	2167 - 2167
0106 - 010A	0496 - 049E	2B85 - 2B88
0100 - 010F	04A0 - 04B7	2B8C - 2B8E
0112 - 0115	04B9 - 050C	2B91 - 2B93
0118 - 011B	050E - 0532	2C1F - 2C42
0110 - 0121	0534 - 05CF	2C7A - 2C7F
0125 - 012C	0501 - 0503	2C81 - 2C82
010A - 01EF	0674 - 0707	2C8A - 2C8C

Model 3 vs. Model 1 ROM differences

The table above shows only the addresses (in Hexadecimal) where the Model 1 and Model 3 ROMs differ. Notice that the bulk of the changes are in the first 2K of the ROM (where the I/O driver routines reside) while changes to the BASIC interpreter itself are relatively minor. Although many entry points for common routines have been maintained, the Model 1 066CH entry to 8ASIC can no longer be used (the entry 1A19H should be used instead).

Adapting Model 1 m.l. programs is then a matter of changing ROM calls and entry points where they differ and moving those programs that reside at the bottom of BASIC's memory up to clear the extra scratch pad RAM area. With the aid of an Editor/Assembler and the source code listings in the magazine, most Model 1 m.l. programs can, with a little effort, be made to run on your Model 3. If you have any additional information or a patch that you have developed, send it in to us and we will include it in this section for the benefit of all our Model 3 readers.

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***** WHAT YOU HAVE MISSED *****

Set out below is a list of some of the programs published in early issues of MICRO-80 magazine. Back issues are available for \$2.50 each or at the annual subscription rate for 12 or more copies. Cassette editions are available for all issues for \$4.00 each whilst disks are available for all issues from September 1981 onwards. For 12 or more magazines with cassettes/disks ordered at the same time, the relevant annual subscription rate applies. Programs for the Hitachi Peach/TRS-80 Colour Computer were first published in the April 1982 issue.

Issue 6 - * May 1980

- * Some issues incorrectly labelled April.
- SUB ATTACK (L1)
- SPACE DRIVE (L1)
- TRIG/BAS (L2)
- SUPER SIZZLER (L2)
- TIC-TAC-TOE (L2)
- HOUSEHOLD ACCOUNTS (L2)
- CONNECTA and CONNECTX (L2)

Issue 15 - February 1981

- PINBALL (L1)
- KEYNOTE (L1)
- LEVEL II TBUG UPOATE (L2)
- MICROHEX (L2)
- SEA WOLF (L2)
- ASTRONOMY (L2)
- MUROER (L2)

Issue 18 - May 1981

- ARITHMETIC (L1)
- SORTING (L1)
- NORMAL DISTRIBUTION (L2)
- DISASSEMBLER (L2)
- 12 HOUR CLOCK (L2)
- BONES (L2)
- PHILATELIC ADVISER (L2)
- UNIVERSAL LOWER-CASE DRIVER ROUTINES (L2)

L1 - Level 1 program

CC - Colour Computer

L2 - Level 2 program

HP - Hitachi Peach

The following back issues of MICRO-80 magazine are still available:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
'79	-	-	-	-	-	-	-	-	-	-	-	/
'80	/	/	/	x	/	/	/	x	/	x	x	/
'81	/	/	/	/	/	/	/	/	/	/	/	/
'82	/	/	/	/	/	/	/	/	/	x	-	-
'83	-	-	-	-	-	-	/	/				

(- means never published, / means issue available, x means issue out of print).

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PROGRAMMING

***** THEORY AND TECHNIQUES OF SORTING - PART 8 *****

by Bernie Simson

In Part 7 of this series, it was shown how records from an input file for sorting were extracted, sorted in main memory and stored away in a workfile for later merging. This article will examine in more detail the processes involved in storing sorted sublists of records in workfiles, and some merging methods.

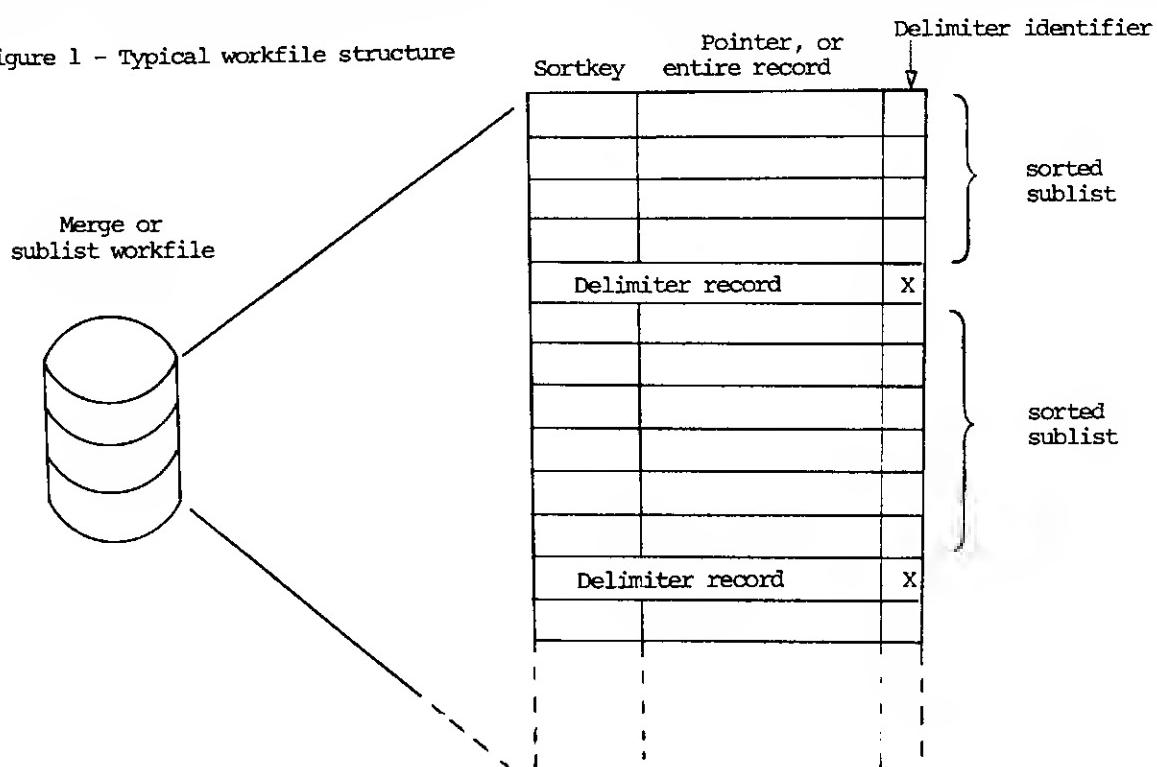
PRODUCTION OF SORTEO SUBLISTS.

Since the external sort phase (merging) involves a great proportion of the total sort time due to disk operations, it follows that to optimise the sort, the total number of disk operations should be kept to a minimum, in particular, track seeks. This occurs when the read/write head is instructed to find or write a record based on a random address, rather than a read or write of the next sequential record. This is not always an easy criterion to allow for in a restricted disk-based system, which is usually the case with most microcomputer configurations.

A restricted disk system is defined as a system having less than four head actuators. A head actuator refers to the mechanism in a disk drive that controls the movement of the read/write head, not the read/write head itself.

The reason for this is explained later; a system having four logical drives in two double sided disk drives has only two head actuators, and is therefore considered a restricted disk system

Figure 1 - Typical workfile structure



for optimum merge time purposes.

When a sublist has been sorted in memory and is ready for storage in a workfile, the records (or ADOROUT pointers) are written out with the same sortkey used to determine ordering in the internal sort phase. This same sortkey is used to determine ordering during merging. Now, depending on which variation of merge technique is used, which is governed by the number of head actuators available, the sorted sublist is written out to one workfile, or several different workfiles. Also, a sublist delimiter is written at the end of each sublist to separate them in the same workfile. The delimiter would obviously have to contain some unique identifier to avoid it becoming confused with a sublist record. Figure 1 shows the format of a typical workfile.

If more than one workfile is used to store the sublists, then they are used in an alternating fashion, so that the sublists are distributed fairly evenly over the workfiles.

When all the records from the input file have been extracted and sorted in memory, the result should be one or more workfiles containing sorted sublists separated by delimiters. The workfile(s) are then used as input to the merge process.

MERGING TECHNIQUES.

This is where most of the disk operations occur, so it is wise to devote some extra thought to optimising this aspect of the sort if you are designing a sort package.

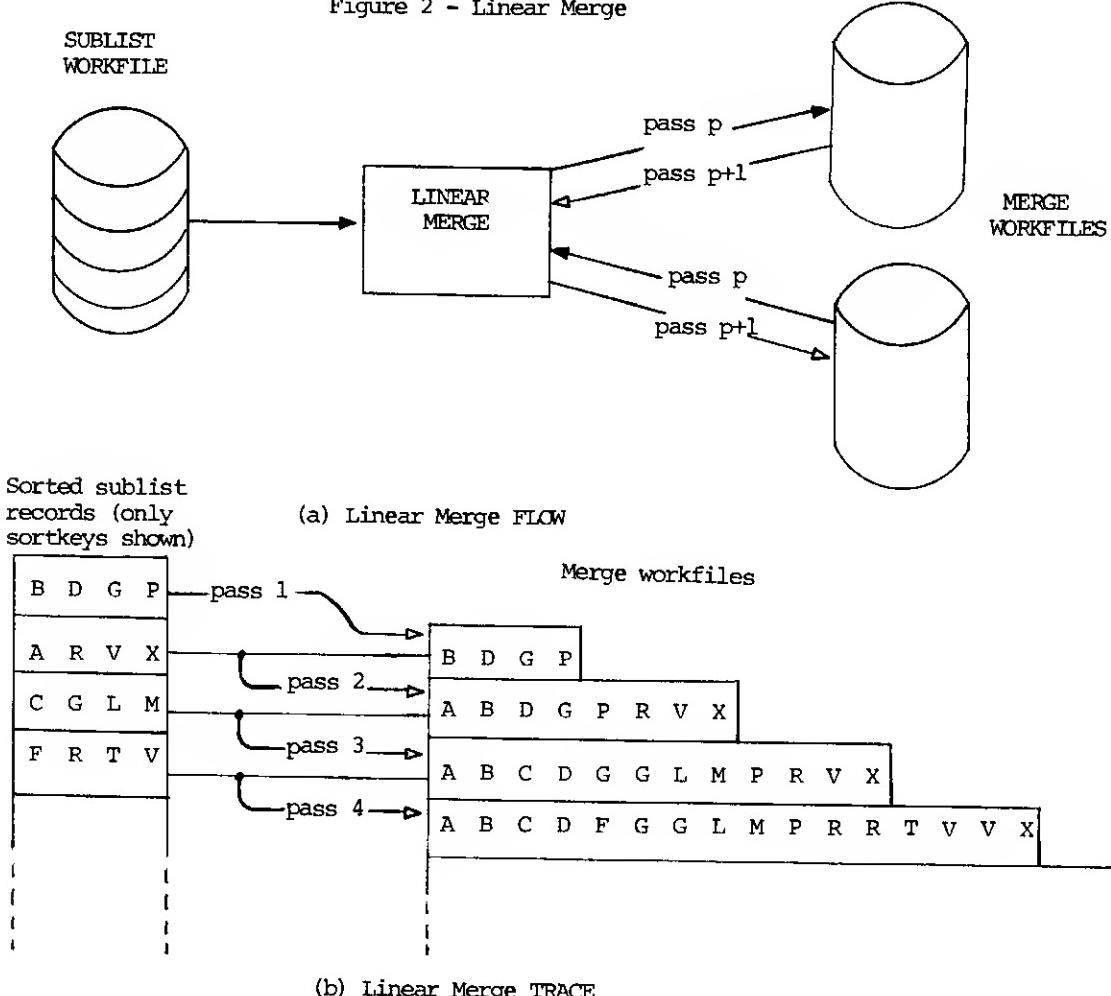
Two merge techniques will be shown, with some variations applicable to restricted disk systems. The two merge types are:

- Linear Merge, and
- Tree Merge.

LINEAR MERGE.

Linear merging is shown in Figure 2. Only one sublist workfile is required as input. It involves reading the sublist records and merging them with records in the merge workfile that was created

Figure 2 - Linear Merge



during the previous merge pass, to produce a new merge workfile. This is then used as input to the next merge pass, together with the next sublist in the sublist workfile. The merge workfile output from each merge pass grows in a linear fashion.

Do not confuse sublist workfiles with merge workfiles. Sublist workfiles are created when sorted sublists are stored on completion of each sublist memory sort, whereas merge workfiles are temporary files created by the merge process. The internal operation itself is quite simple, and is common to both merge types. At any one point in time, two records from each file to be merged are compared, and the one with the smallest sortkey value is written out to another merge workfile, and the next record from the workfile from which the written record came, is read, and the comparison repeated. A three-way merge could be implemented if desired, involving reading 3 files at one time, and writing out a record depending on the result of a three-way comparison, but this discussion is restricted to a two-way merge to avoid confusion (if you aren't confused already).

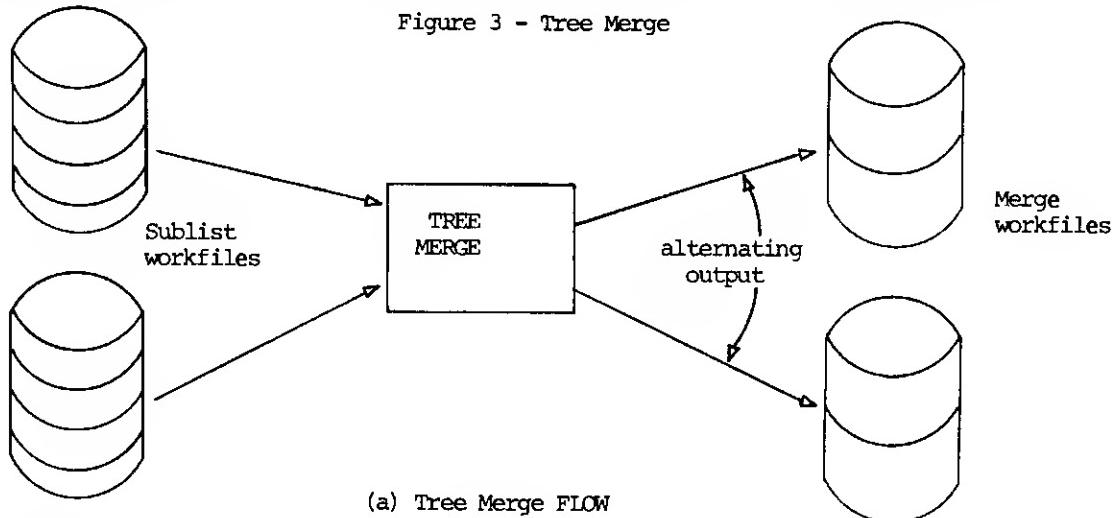
A variation to this merge technique involves reading all the records in the sublist workfile into memory, and using this array as one of the inputs to the merge (with the merge workfile). This assumes that the entire sublist will fit into memory. It should do so, as it was originally written out from memory in the internal sort phase, unless the sublist was produced according to the process described in Figure 2(A) of the previous article (Part 7). You will notice that in this case, the original input file is referenced to retrieve the entire record using the pointer in the array as index, thereby creating a sublist in the workfile that is larger than the sorted array.

This variation is useful where only two head actuators are available - one to read the merge workfile, the other to write the new merge workfile, while actual merge is taking place. Track seeks will not occur, even though 3 files are involved, because the reading of the sublist workfile is not simultaneous with the reading and writing of the merge workfiles.

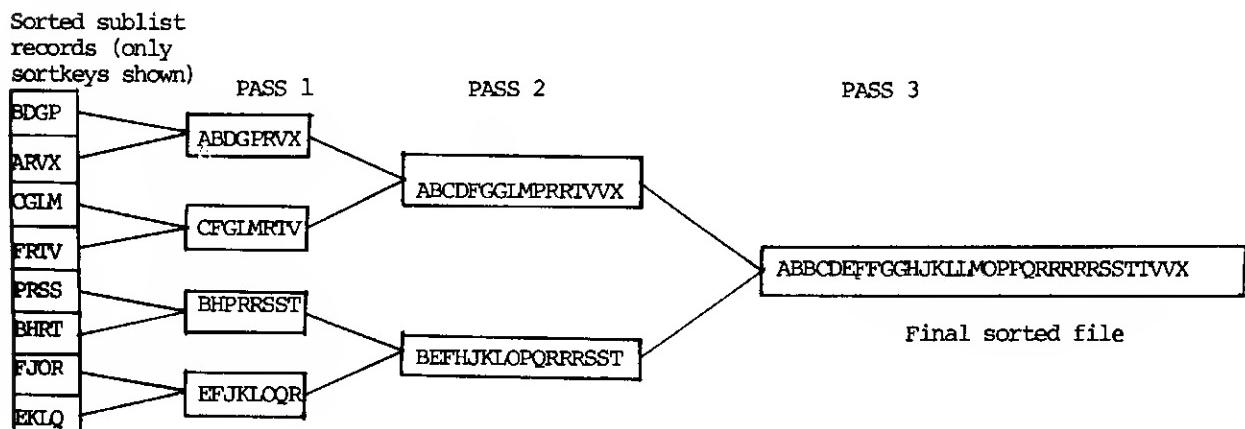
TREE MERGE.

Tree merging is shown in Figure 3. Although the sorted sublists are distributed over 2 sublist workfiles, the structure of each is still consistent with Figure 1. However, you will notice the different algorithms as evident in the merge pass traces in Figure 2(B) and 3(8). The tree merge creates multiple merge workfiles, again distributing them over another 2 new merge workfiles

Figure 3 - Tree Merge



(a) Tree Merge FLOW



(b) Tree Merge TRACE

in an alternating fashion in the same way that the sublist workfiles were produced. These 2 new merge workfiles are then used as input in the next pass to produce 2 more merge workfiles, this time replacing the 2 merge workfiles used as input in the previous pass. This technique produces sublists that are continually doubling in size, until only 2 sublists exist in separate workfiles, when they are finally merged to produce the final sorted file.

Now in order to eliminate track seek, the four workfiles active during any one pass must exist on separate disks under the control of separate head actuators. A double sided drive has only one head actuator, so unless 2 workfiles are placed on the same tracks on each side of the disk, track seek will occur. I don't know of any OOS that will allow, without complexity, control over where on the disk a file is placed.

If less than four head actuators are available, then it may be better to have only one sublist workfile, as in the Linear merge, rather than incur an overhead of two extra files on the disk. Track seek will occur anyway.

If this variation is adopted, two sublists are read simultaneously for merging, so it will be necessary to maintain some information as to the starting address of each sublist, maybe by using a linked list that is updated when the sublist workfile is created. The output from this variation is also just one workfile, which is used as input for the next merge pass. The algorithm is the same as for the four-file Tree merge - doubling the sublist sizes on each pass.

COMPARISON OF THE TWO MERGE ALGORITHMS.

The Linear merge is the simpler to implement, but the Tree merge is the more efficient. This is usually the case in life....decisions, decisions.

The sort package designer must decide on a trade-off between simplicity or efficiency, also taking into account the environment in which the sort package will be implemented, in particular, the likely number of head actuators available.

To assist the budding designer, I have prepared a table giving the maximum number of sublists serviced by one head actuator during a merge pass, for the two algorithms. The smaller the number, the less track seek activity.

MERGE TYPE:		LINEAR	LINEAR VARIATION	TREE	TREE VARIATION
NO. HEAD ACTUATORS	4	1	1	1	2
	2	2	1	2	2
	1	3	2	3	3

This gives an indication of the likely track seek activity for a given environment, which will have a bearing on the overall efficiency of a particular algorithm - for instance, the Tree merge algorithm, although being more efficient than the Linear variety as demonstrated below, may turn out to be less efficient if bogged down in a multitude of track seeks in each pass.

EFFICIENCY ANALYSES.

For the purposes of these analyses, it is assumed that track seek activity is the same for both algorithms, and therefore does not enter into the comparisons.

An accurate measure of the efficiency of a merge algorithm can be made by examining the average number of times any particular record in a workfile is moved from the first pass to its placement in the final sorted file. That's what merging is all about - moving records from one file to another.

This can be done by determining the number of passes that will be necessary to merge all the sublist records, governed by:

N... The number of records in the original input file (and therefore, the number of records in all the sublists),

S... The size of each sublist, which is governed by the internal sort array size (i.e. memory size).

Then the total number of records output in all the passes is calculated, and finally, this is divided by N to give the average times each record is moved.

LINEAR MERGE.

From the Trace in Figure 2(B), it is evident that each pass involves writing 4 more output records than in the previous pass, i.e. the output merge workfile grows by the size of the input sublist.

If you were to list the number of output records for each pass, you would notice that the numbers represent an arithmetic progression, where the sublist size is the first term, and also the

common difference.

So, substituting the variables in the arithmetic progression formula:

$$\text{Sum} = (N/2)*(2*A + 0*(N-1))$$

Where N = number of terms, A = First term, 0 = common difference, we get:

$$\text{Sum} = (N/(2*S))*(2*S + S*((N/S)-1))$$

Because the number of passes = N/S (Also the number of terms in the progression), the first term is S, and the common difference is also S.

This formula can be simplified to:

$$\text{Sum} = N*(S+N)/(2*S)$$

This represents the total number of records output in all the passes, so the average number of records moved is:

$$\text{Ave} = (S+N)/(2*S)$$

Now for the Tree merge analysis.

TREE MERGE.

From the trace in figure 3(B), a relationship can be seen between the number of passes required to produce the final sorted file, and the number of sublists in the workfile(s) at the start of the first pass. This relationship is exponential, and is defined by:

$$2^P = L$$

Where P = number of passes, and L = number of original sublists. Since L is defined by N/S (total number of records in the original unsorted file divided by size of each sublist), the number of passes is derived as:

$$P = \text{LOG}(N/S)/\text{LOG}(2)$$

or $\text{LOG}(N/S)$ to Base 2.

For the purposes of this analysis, it is assumed that the number of sublists before the first pass is a power of 2, i.e. 2³. This is where the Tree merge algorithm becomes more complex to implement, when the number of sublists is not a power of 2, so that during merging, a sublist is left unpaired and must be kept track of for merging in the next pass.

The relationship in Figure 3(B) is very similar to the number of accesses required to traverse a binary tree or to do a binary search, to locate an element. Since in each pass, each sublist doubles in size, and the number of sublists are halved, the total number of output records written in each pass remains the same as N (total number of original records). Therefore, the total number of records output is:

$$N * (\text{LOG}(N/S) \text{ to Base 2})$$

and the average number of times each record is moved is:

$$\text{Ave} = \text{LOG}(N/S) \text{ to Base 2},$$

which also happens to be the number of passes, a fact that is evident from the trace in figure 3(B).

Now that the formulae have been derived for the 2 algorithms, their efficiencies can be compared, given different sort file sizes, and sublist sizes (i.e. memory sizes). Using the formulae, the average number of times each record is moved in the entire merge is:

N (FILE SIZE)	S (SUBLIST SIZE)	LINEAR MERGE	TREE MERGE
256 recs	64 recs	2.5	2
1024	64	5.5	4
1024	512	1.5	1
16384	512	16.5	5
50000	2000	13	4.6
100	100	1	0

The figures obtained in the last line are correct according to the formulae. However, in practice, where the file size is the same as the sublist size (entire file fits in memory), the Linear merge will not transfer the sublist to a workfile, as shown in the trace in Figure 2(B).

Obviously, if all the file fits in memory, no merge is necessary, so a figure of zero means no merge, or record movement.

This comparison demonstrates the efficiency of Tree merge over Linear merge but, as mentioned above, it may be affected by other factors such as track seek, so trial and error may be the only way to determine which is most suited to a particular environment.

TO SUMMARISE...

Merging is the final process involved in sorting a file of records. Its purpose is to combine sorted sublists produced by the internal sort process because the input file is too big to fit in main memory at the one time.

The placement of sorted sublist workfiles in a restricted disk-based system is important in order to optimise sort time due to the effect of track seek activity. Therefore, some trade-offs may be necessary to minimise this.

Two merge algorithms are Linear Merge and Tree merge. Tree merge is the more efficient in a system where track seek activity is not a limiting factor. Where it is, the choice as to which will be more efficient is governed by the particular environment where the sort package is installed.

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***** MICROBUGS *****

Although we make every effort to ensure accuracy in the material we publish, inevitably errors and omissions will occur. In this section, we print corrections to those bugs that have been reported.

GOLF - July, 1983 Vol.3, No.12 - page 27.

The listing published in the magazine contains a small error in line 2170. It should read:

2170 IFS1<TPARTHENS1\$="UNDER":SX=TPAR-S1ELSE\$1\$=" =PAR":SX=S1

The cassette version of the program also contains this error.

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SOFTWARE

***** THE TOWERS OF HANOI - (Colour) by M. Byrne *****

The 'Towers of Hanoi' is played with a number of disks of differing sizes and three pegs on which the disks may be stacked. Initially the disks are arranged on one peg in order of decreasing size. The object is to transfer them (in the least number of moves) to another of the pegs so they are once again arranged in order of decreasing size. However, you may only move one disk at a time and it must not be placed on a smaller disk.

This program allows you to select the number of disks (up to a maximum of 10 for the Hitachi Peach and 8 for the Colour Computer) and whether you or the computer will solve the problem.

The main variables used are:

N(3)	holds the number of disks on each peg.
P1(), P2(), P3()	are peg arrays. Each element holds the size of the disk at that position.
SK()	the parameter stack.
SC	the source peg.
DN	the destination peg.
AL	the alternate peg.
NM	the move counter.
SP	the stack pointer.
B	the base pointer for the stack elements of the previously invoked procedure.
CT	the number of disks.
S	the amount of delay (for automatic operation).
F	the peg the disk is moved from.
T	the peg the disk is moved to.
T1, T2	used to test whether the move is legal.
M	is the minimum number of moves.
T0	the top disk of the peg we are moving from.

Probably the feature which will cause most confusion is the use of recursion. It appears to be a not-too-well-known fact that BASIC will allow recursion (on most machines anyway). Recursion is a means whereby a procedure or subroutine may call itself. This involves the use of a stack (which BASIC provides) for storing the return address and another stack (which must be set up explicitly) if parameters are to be passed to the called procedure.

The parameter stack is only really used when automatic operation is required as manual operation

merely involves asking for moves and checking their validity.

The current top-of-stack is indicated by SP. When used by the main procedure, the top stack element holds the number of the alternate peg for this move, top of stack - 1 holds the number of destination peg for this move, top of stack - 2 holds the number of the source peg for this move while top of stack - 3 indicates the numbers of disks still to be moved.

When used by the shift procedures the top of stack contains the number of the destination peg and top of stack - 1 contains the number of the source peg.

Because the parameter stack must be explicitly set up and manipulated in BASIC, the algorithm tends to become somewhat obscured. Also if it is the first time you have encountered recursion, BASIC is not the ideal language to learn about it. For those of you who are interested in finding out more, the tree-diagram for the algorithm used in this program is given in the book 'An Introduction to Problem Solving Using Pascal' by Kenneth Bowles.

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***** OTHELLO - Colour Computer by S. Gibbons *****

Othello is written for the 16K Tandy colour computer. Othello is a game of strategy for two players and is based on, and very similar to, the board game by the same name.

The rules are the same as the original and are explained in the program.

The playing board is made up of 64 squares (8 x 8). The vertical and horizontal positions are represented by numbers 1-8 shown at the top, bottom and both sides of the board.

The disks are represented by squares which are black on one side and white on the other. (Only one side of the disk is shown at any time).

The disks are placed alternately by each player starting with black. To place a disk on the board you give the horizontal position then a comma followed by the vertical position. The computer will tell you if you give the coordinates of an illegal position.

The progressive score is constantly shown at the top right hand corner throughout the game. The score is based on the amount of disks each player has on the board in his possession.

The game will end when all the board has been filled with disks. The winner is determined by the colour which has the most disks.

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***** REGISTER DISPLAY PROGRAM (Peach) - by O.J. Omund *****

This provides an easy means of examining register contents at any time during the operation of a program. It is similar to the facility provided by the machine-language monitor but whereas that can only be initiated from the keyboard (MON + R), the Display Program can provide register content information at any point in a program then can revert either to the program under test, to BASIC command level or to the machine-language monitor.

LOADING.

A short program written in BASIC loads the data listing, sets the routine into operation to first initialize the Software Interrupt vector then provide a sample display. At this stage, the BASIC loading program can be discarded.

The location at which the operational program is stored in memory can be specified by the operator if desired during the BASIC loading phase. Alternatively, the program can be stored in a "default" location at the top end of User RAM.

OPERATION.

The display program is initiated by a Software Interrupt i.e. by a 3F instruction inserted in a program under test. Alternatively, an EXEC command inserted in a BASIC Program and directing control to the display routine, provides return options as follows:-

- (a) EXEC &H6F95 returns to the program under test
- (b) EXEC &H6F97 returns to BASIC command mode
- (c) EXEC &H6F9B returns to the machine-language monitor

On the occurrence of a SWI, all registers are saved on the stack. The stack pointer value is

derived (6FGF) and placed on the stack. Use is made of various subroutines in the ROM to designate and display the register contents e.g. 6FA7 prints 'S' then 6FAC-6FB3 the SP value. 6FB9 refers to the register headings table (used by MON) then up to 6FCA, displays registers CC, A, 8, OP in successive loops.

6F00 to 6FE1 prints the 2-byte registers X, Y, U and PC and 6FCC-E tests for completion. 6FE3-F is a stack of "print spaces" which is entered at various levels to provide the required number of blanks for the screen display.

The last two lines 6FF3-5 restore all register values (equivalent to RTI) following which control moves to the PC value stored at the time of Software Interrupt. This is the means by which the return options are tied to the point of entry into the display routine.

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***** OESERT - CHASE - L2/16K by A.N. Oowney *****

In this game of high adventure, the object is to travel a distance, which varies between 200 and 300 miles, across the vast Simpson Desert.

Your journey is made perilous due to hazards such as: wild tribesmen, lack of water, sandstorms, etc. As all good travellers of the desert know, you must take care of yourself and your equipment. However, if you find yourself in trouble you can always hope for help - although this is not always forthcoming.

The game is extremely easy to play and is very addictive. Many hours have been spent at my keyboard trying to beat the odds. There is some strategy involved in this game, however, with the number of random variables included it is extremely difficult to rely upon this fact.

As for the program itself: all line numbers are in intervals of 10, beginning at 10 so "AUTO" may be used through the program. I apologise for the lengthy graphic lines (Line No's 990 - 1430). However, I am sure some of you can design your own routine for these. I assure you that, although lengthy, they are well worth the work involved. The distance required to travel is set up in variable R - contained in Line No. 20. This may be changed to suit your requirements (make it less for a shorter distance).

I won't explain any more as it will take some of the fun out of it, and the program is self-prompting. So, good luck with your Oesert Chase.

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***** FORMATION - L2/16K (C) by David Grigg *****

An Electronic Form Creation and Data Entry System.

INTRODUCTION.

Entering large amounts of data can be the most tedious and frustrating part of using a personal computer. Storing that data on cassette tape, if you don't have disk drives, can be even more time consuming and annoying. If data is to be entered during program execution, then appropriate prompts can be written into the program in the form of PRINT or INPUT statements, but this can be fiddly and difficult. Data entered in this way can only be stored on tape using the snail's-space PRINT # statements, and what's more, there is always the chance that a program error will cause execution to stop, which usually means losing data entered during execution. Rather safer is entering data in the form of DATA statements in the program itself. But having to type the word "DATA" at the beginning of every line can be tedious. Commas have to be inserted between data items, and it is all too easy, with a long list of numerical data items, to lose track of how many you have entered, or which order they are in, since there are no prompts. So this method of data entry can be equally tedious.

In a non-computer situation, we are all used to filling in forms when information is wanted. Although this can be wearying, at least we always know what data is wanted, how much room we have to fill it in, and we can always go back to correct a previous entered item, if we have made a mistake.

Business computer systems have offered electronic form systems for data entry for some time, whereby an electronic form is presented on screen so that a relatively unsophisticated operator can enter data in the same sort of way as filling in a form by hand, with all the advantages of that method.

FORMATION is a computer program for the Model 1 TRS-80 and the System 80 which gives you the same capability, with the very valuable feature of being able to quickly and simply design your own electronic forms, then save the design for future use. Data is stored in the form of DATA

statements automatically appended to any existing BASIC program in memory. The data can then be stored on tape simply by using the CSAVE command in the normal manner.

HOW TO USE "FORMATION".

1. Loading the program.

Turn on the computer then type SYSTEM (enter). To the SYSTEM prompt answer FORMAT (enter), and press the play button on the recorder. When the prompt returns, type / (enter), and the REAOY prompt will appear. Now you can load any BASIC program you wish to append data to. When you are ready to use FORMATION, type OPEN in command mode. The list of FORMATION options should appear.

2. A Sample Form

To see how FORMATION works, choose option 4, FILLING EXISTING FORMS. The screen will fill up with a sample electronic form, for a simple mailing list program. Look at the format of the screen. The areas marked out by underline symbols () are "entry fields". A blinking block cursor will be present at the beginning of the first field.

Type in some appropriate data, perhaps your own surname first. Then hit ENTER (NEW LINE for the System 80). The block cursor will skip to the beginning of the next entry field. The down arrow key would have the same effect (CTRL key for System 80). Before you enter your initials hit the up arrow key (or ESC Key). The cursor will skip back to the beginning of the previous field. Hit ENTER again to go forward to the next field. Continue to fill in appropriate data in all the fields. If you make a mistake, backspace in the usual way, or use the up arrow key (or ESC Key) to return to a previous field. Once all the data is entered to your satisfaction, hit CLEAR (or for the System 80, hit shift @). All the data will vanish, and the cursor will be back at the beginning of the first field.

Note that if you type right to the end of a field, the cursor automatically skips to the next field. Similarly, backspacing past the beginning of a field skips you back to the start of the previous field.

You can either continue to enter new data, or you may like to escape from this mode to see what has happened to your data. To do this, hit shift up arrow key (or shift ESC). The list of options will return. This time choose option 5, RETURN TO BASIC. The Ready prompt will appear.

Now LIST. The data you have entered will be listed as one or more DATA statements beginning at line 32005, with commas inserted between items which were entered in different entry fields. If an existing BASIC program had been in memory, these statements would have been appended at the end of this program.

To return to FORMATION type OPEN (enter).

3. Creating a New Form

To create your own electronic form, choose option 2, CREATE A NEW FORM. Or the existing form in memory can be modified or added to by choosing option 1. If option 2 is chosen, the screen will clear, and the cursor will appear at the top left of the screen.

You may now type in any text you choose to act as prompts. The down arrow key (or CONTROL) key will drop the cursor down one line. The up arrow key (or ESC) key will jump it up one line. The backspace key acts normally, though you will find that the cursor is non-destructive. If you want to wipe out a character, you should use the space bar. On the TRS-80, the right arrow key acts as a non-destructive forward space. The ENTER (or NEW LINE) key will move the cursor to the start of the next line. Using these keys, the cursor can be quickly moved around the screen to enter text wherever you like.

However, to create the vital entry fields, the underline symbol must be used. This symbol is accessible by hitting the @ key. An entry field begins with an underline symbol and continues to the end of a string of such symbols. Any break in this string creates a new entry field. So if you were to type " " this would establish one entry field four characters long, but typing " " creates four entry fields, each one character long. Entry fields can be created anywhere on the screen, and you may create up to 80 separate entry fields.

It will be important for you to make a written record of which entry fields you have established, what data they will contain, and their order (from left to right, top to bottom). The reason you need to note this is so that your BASIC program will be able to access the data in the right order, and with the right type (numerical or string as appropriate).

Once the form is complete to your satisfaction, type shift up arrow key (or shift ESC) to return to the option list. If your form is only for temporary usage, you can proceed to fill this form as you did with the sample form. However, you will probably wish to save this form for future use. To do this, put a blank cassette in your recorder, and choose

option 3. After you have pressed the record and play buttons, you can save the form onto tape.

Note that the entire FORMATION program, complete with new form, is saved in this way. This means that any time you wish to use your own form, you need only load the one SYSTEM Program. FORMATION was designed in this way for your convenience.

NOTE: Some characters, if entered when filling in forms, will be changed before they are inserted into the DATA statements. This is because otherwise they would act as delimiters and mess up the DATA statements. These characters are double quotes ("), comma (,), and the colon (:). They will be changed to the characters +, +, and + respectively. Your BASIC program may need to take this into account.

FORMATION COMMAND SUMMARY.

CREATE MODE:

	TRS-80	SYSTEM 80
* Move cursor up one line	↑	ESC
* Move cursor down one line	↓	CNTRL
* Move cursor forward one space	→	not available
* Move cursor back one space	←	+
* Insert underline symbol	@	@
* Move cursor to start of new line	ENTER	NEW LINE
* Escape from this mode	shift +	shift ESC

FILL MODE:

* Cursor to start of last field	↑	ESC
* Cursor to start of next field	↓	CNTRL
* Move cursor forward one space	→	not available
* Move cursor back one space	←	+
* Move cursor to start of next field	ENTER	NEW LINE
* Record data, start clean form	CLEAR	Shift @
* Escape from this mode	shift +	shift ESC

FROM BASIC:

Type OPEN (enter) to return to FORMATION

NOTE: FORMATION makes extensive use of calls to the Microsoft Basic ROM in order to reduce the amount of memory it takes up. It is possible that the program will not work with some late model TRS-80's with the revised ROM.

This program is for L2/16K machines only. Users of Level 2 machines with more than 16K MUST respond to MEMORY SIZE with 32767. This program WILL NOT work on a Disk Basic machine.

SYSTEM 80 owners who do not have a right arrow key may get around the problem of right direction cursor movement by pressing the backspace key until the cursor wraps around the screen. The desired position may then be reached as it is approached from the right side of the screen.

(The distribution disk contains an offset version taking the user to Level 2).

- 000000000 -

***** PRIORITIES - L2/16K by A.F.J. Bell *****

This program was written for two reasons. Firstly, because of the activities of the Razor Gang there was a need to be able to review the activities of my hospital and put them in order of priority. Secondly, I wanted to get some experience in using string matrices.

The program enables one to specify up to 12 activities, and to assign a rank to the importance and to the feasibility of each activity. Then the computer finds the product of the importance and the feasibility, which can be taken as the relative priority which each activity should receive. One can review, add or change data until one is satisfied. One can then order the activities according to their importance, feasibility, or priority, and printout the results.

Lines 10 to 120 are housekeeping. Line 60 sets my Microline 80 Lineprinter to 10 chrs/in and 64 chrs/line, sets the page length to A4 size, and sets the linenum counter to 0. You will need to change this to suit your type of printer.

Lines 190 to 240 display the options. The rather complicated system in lines 220 to 240 enable one to use a single stroke INKEY\$ system.

CHR\$(13) in lines 250 to 300 (the instructions) is the control character for linefeed/carriage return.

Lines 310 to 440 accept data from the keyboard, and puts the data as string values in a string matrix (two dimensional array). Line 430 converts the string values into numerical values,

MICRO-80 PRODUCTS CATALOGUE

This catalogue contains a selection from the wide range of peripherals, interfaces, computers and software carried by MICRO-80 for your computer. If you don't see the item you want, contact us, we probably have it anyway!

MICRO-80 has been supplying customers throughout Australia and the Pacific region by mail-order for 2½ years. Our customers find this a simple and efficient way to do business. You may place your order by telephone or by mailing the order form from any issue of MICRO-80 magazine. Generally, it takes about one week from receipt of order until despatch. You should allow 2-3 days for your letter to reach us and 7-10 days for the parcel to reach you, making a total turnaround time of 2½-3 weeks.

WARRANTY AND SERVICE

All hardware products carry a 90 day parts and labour warranty either from the manufacturer/distributor or from MICRO-80 Pty Ltd. In many cases, warranty servicing can be arranged in your own city, otherwise goods will be repaired by our own team of technicians in our Adelaide workshops.

TRADE-INS AND TERMS

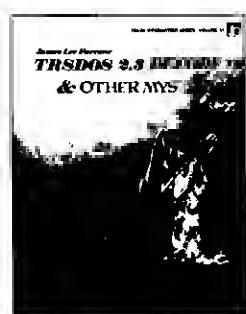
MICRO-80 can accept your existing equipment as a trade-in on new equipment. We can also arrange consumer mortgage financing or leasing on larger hardware purchases. Contact us for details.

BOOKS

TRSDOS 2.3 DECODED AND OTHER MYSTERIES

by James Farnour

The TRSDOS operating system explained with a fully commented source code listing, a description of the command line Interpreter and the subroutines used by the DOS commands, the file management system, the error message processor and much, much more. Excellent value at \$39.95 (plus \$1.20 p. & p.)



BOOKS

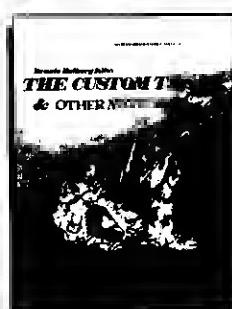
THE CUSTOM TRS-80 AND OTHER MYSTERIES

by Dennis Bathory Kitsz

Ever wanted to do things to your TRS-80 that Radio Shack said couldn't be done? How about reverse video, high resolution graphics, and audible keystrokes?

Now enough? How about turning an 8-track into a mass storage device, making music, controlling a synthesiser, individual reverse characters, and a real-time clock just to name a few?

The Custom TRS-80 and Other Mysteries is packed with more than 290 pages of practical information and can be yours for only \$39.95 (plus \$1.20 p. & p.)



BASIC FASTER AND BETTER AND OTHER MYSTERIES

by Lewis Rosenfelder

Basic is not nearly as slow as most programmers think. *Basic Faster and Better* shows you how to super charge your BASIC with almost 300 pages of fast, functions and subroutines. You won't find any trivial poorly designed "check-book balancing" programs in this book — it's packed with useful programs. Tutorial for the beginner, instructive for the advanced, and invaluable for the professional, this book doesn't just talk . . . it shows how! *Basic Faster and Better* is \$39.95 (plus \$1.20 p. & p.)



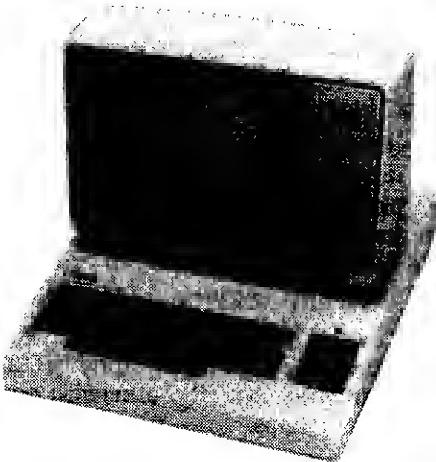
MACHINE LANGUAGE DISK I/O and OTHER MYSTERIES

by Michael Wagner

The guide to machine language disk software for TRS-80 Models 1 and 3 that explains what the floppy drive system is all about, disk controller chips, read/write access, head step and seek commands, forced-interrupt command, disk files, how records are stored on disk, creating a file, etc. You also get a disk formatter program, a program to calculate passwords and much more for only \$39.95 (plus \$1.20 p. & p.)



Introducing the NEW LNW80 MODEL 2



The new LNW Model 2 is not just a microcomputer but a complete computer package that includes excellent hardware, extensive systems software and a range of application software. Manufactured by LNW Research Corporation, the LNW Model 2 features:

HARDWARE:

- 4MHz Z80A microprocessor with 96K user RAM.
- 16K x 6 bits Graphics RAM, expandable to 64K (four pages).
- Printer, RS-232-C and cassette Interfaces.
- 12K BASIC in ROM (Level 2 compatible).
- Support for single/double sided, single/double density, 5½" or 8" disk drives.
- Full TRS-80 Model 1 compatibility.
- Hi-res Colour (RGB) and B & W video outputs.
- Four Hi-Res Graphics Modes:
 - B & W 128 x 48
 - B & W 480 x 192
 - 8 colour 128 x 192
 - 8 colour 480 x 192
- Three text displays Modes:
 - 64 char x 16 lines
 - 80 char x 16 lines
 - 80 char x 24 lines

APPLICATION SOFTWARE:

1. LNW Small Business and Professional Accounting Series — *including General Ledger, Accounts Receivable, Accounts Payable and Payroll (U.S.A. conventions)*.
2. Electric Spreadsheet — *for financial planning and forecasting*.

The LNW80 Model 2 is perfect for the serious hobbyist or businessman seeking a higher performance, more reliable computer to replace his TRS-80 Model 1 without sacrificing a huge investment in software and programming experience.

LNW80 Model 2 computer	\$2,850
	<i>(complete except for disk drives and monitor)</i>	
HI-RES Green Phosphor Monitor	\$265
Super HI-RES Hitachi RGB Monitor	\$1,250
Two Single-sided 40 Track Double Density Disk Drives	\$825
	<i>(In cabinet with power supply and cable)</i>	

All prices include Sales Tax and are subject to change without notice. Prices are FOB Adelaide. Add \$20 road freight anywhere in Australia. All equipment carries MICRO-80's Australia-wide 90 day warranty covering parts and labour.

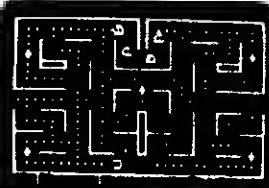
SYSTEMS SOFTWARE:

LNWBASIC 4.0 — an extension to disk BASIC that allows full use of the LNW80's graphics capabilities through the addition of powerful graphics commands such as CIRCLE, COLOR, DRAW, etc.

DOSPLUS 3.4 — the fast, reliable and easy-to-use operating system that provides all the file control and disk management you need for maximum benefit from your disk drives as well as an enhanced disk BASIC.

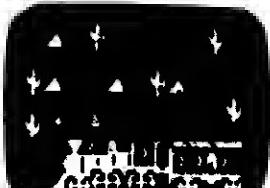
LNW-CP/M — the CP/M operating system opens the door to a whole new world of software. LNW-CP/M was designed to be compatible with application programs written for CP/M 2.2 and provides the user with a 61K system

3. Electric Pencil — *an easy-to-use word processor*.
4. Microterm — *an intelligent terminal program for communications*.
5. Chart-Ex — *allows you to transform your data into pie, line or bar charts on hi-res display or printer with bit graphics*.

**SCARFMAN**

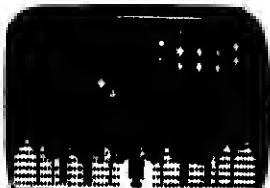
This incredibly popular game craze now runs on your TRS 80! It's eat or be eaten. You run Scarfman around the maze, gobbling up everything in your path. Try to eat it all before nasty monsters devour you. Excellent high speed machine language action game from the Cornsoft Group. With sound.

Price: \$17.95

**THE WILD WEST**

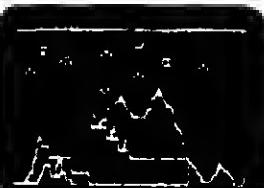
It's up to you to keep the West beautiful with Outlaws and renegade Indians on all sides. Even the train has been captured by Outlaws with all the payroll on board. Can you clean up the Wild West?

Price: \$26.50

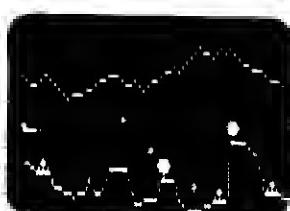
**SPACE ATTACK**

Steady your nerves, keep a sharp lookout, and prepare for battle to save your city. Fiendish aliens are all around, and if they destroy the city you lose.

Price: \$26.50

**STRIKE FORCE**

As the primary defender of a world of cities under deadly alien attack, your weaponry is the latest: rapid fire missiles, long range radar, and incendiary "star shells." Your force field can absorb only a limited number of impacts. A complex game of strategy, skill and reflexes from Melbourne House. Price: \$26.50

**PENETRATOR**

Soar swiftly over jagged landscape, swooping high and low to avoid obstacles and enemy missile attacks. With miles of wild terrain and tunnels to penetrate, you're well armed with bombs and multiple toward missile capability. From Melbourne House. Features sound, trainer mode and customizing program.

Price: \$36.50

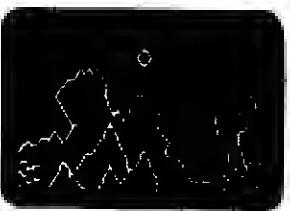


STICKEROO JOYSTICK INTERFACE

for the TRS-80
MODEL I
AND SYSTEM 80

\$32.00
FROM
ADD \$2.00 p & p

CONVERT YOUR COMPUTER
INTO AN ARCADE GAMES MACHINE
Micro-80's Stickeroo Interface Features:

**LUNAR LANDER**

As a vast panoramic moonscape scrolls by, select one of many landing sites. The more perilous the spot, the more points scored -- if you land safely. You control LEM main engines and side thrusters. One of the best uses of TRS 80 graphics we have ever seen. From Adventure International. With sound.

Price: \$26.50

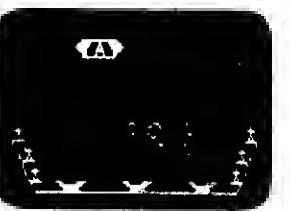
PRICE INCLUDES STICKEROO + INSTRUCTIONS + DEMO PROGRAM LISTING
PLEASE SPECIFY TRS 80 MODEL I OR SYSTEM 80 WHEN ORDERING

STICKEROO
PISTOL GRIP JOYSTICK WITH FIRE BUTTON
S26 + S2 p & p

**SUPER NOVA**

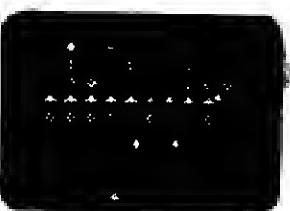
Asteroids float ominously around the screen. You must destroy the asteroids before they destroy you! (Big asteroids break into little ones). Your ship will respond to thrust, rotate, hyperspace and fire. Watch out for that saucer with the laser! As reviewed in May 1981 Byte Magazine.

Price: \$26.50

**METEOR MISSION II**

As you look down on your view, astronauts cry out for rescue. You must maneuver through the asteroids and meteors. (Can you get back to the space station?) Fire lasers to destroy the asteroids, but watch out, there could be an alien Flagship lurking. Includes sound effects!

Price: \$26.50

**GALAXY INVASION**

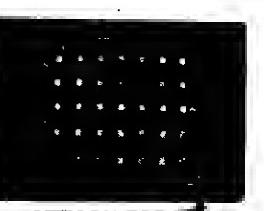
The sound of the klaxon is calling you! Invaders have been spotted warping toward Earth. You shift right and left as you fire your lasers. A few break formation and fly straight at you! You place your finger on the fire button knowing that this shot must connect! With sound effects!

Price: \$26.50

**DEFENSE COMMAND**

The invaders are back! Alone, you defend the all important nuclear fuel canisters from the repeated attacks of thieving aliens, repeatedly. An alien passes your guard, snatches a canister and flies straight off. Quick! You have one last chance to blast him from the sky! With sound and voice.

Price: \$26.50

**ATTACK FORCE**

As your ship appears on the bottom of the maze, eight alien ships appear on the top, all traveling directly at you! You move toward them and fire missiles. But the more aliens you destroy, the faster the remaining ones become. If you get too good you must endure the "Flagship"! With sound effects!

Price: \$26.50

FOR YOUR ENTERTAINMENT

MICRO-80 now offers you the widest range possible in entertainment software. These programs are supplied on cassette for the Level II/16K TRS-80 Model I/III (except as noted). They are also suitable for the System 80 but sound may not be available unless a hardware modification has been fitted to reverse the roles of recorders #1 and #2.

DEFENCE PENETRATOR

\$20.95

DEFENCE PENETRATOR is based on one of the most popular arcade favourites of all time with smooth graphics and sound effects. With realistic scrolling planetscape it's the best game yet.

BATTLE STATION

\$21.50

The aim of the game is to defend your space station against the attack of four alien space ships.

MORGOTH

\$20.95

Morgoth is a unique action packed adventure allowing you to wander through the enchanted dominion of Morgoth and collect the lost treasures of KAZARD KALLAHAN. But Beware! You must escape before the satanic Morgoth is aroused and seeks ye!

KILLER BEETLES

\$21.50

The aim of the game is to dig traps. When a beetle falls in you must fill it in to bury them, before they can catch you.

STAR CRESTA

\$20.95

Star Cresta takes you beyond the limits of your computer and into the Cosmic void itself! Beware! Iron clad concentration and lightning reflexes are required to destroy the evil empress.

JUNGLE RAIDERS

\$21.50

The aim of the game is to defend your four bases from the marauding Jungle Raiders. You kill all the Jungle Raiders and they try to hit you with their spears or drag off all four of your bases.

KILLER GORILLA

\$21.50

Four completely different frames. Each one offering a different challenge, makes this one of the most complex and stimulating games ever written for a TRS-80. The game keeps track of the top ten scores along with a six character name for each score.

JUNGLE BOY

\$21.50

The ultimate challenge! Are your reflexes fast enough to swing Jungle Boy from vine to vine? Can you swing through the jungle? Can you swim by the alligators? These are just some of the things you will find very challenging in Jungle Boy.

STELLAR WARP

\$20.95

Animation with superior fighter craft brings you an even greater challenge. As your computer advances your level, the aliens become more dangerous and the harder it is to stay alive!

HOPPY

\$21.50

The aim of the game is to get your frogs across the busy highway without being squashed and then across the river by means of floating logs and turtles.

INSECT FRENZY

\$21.50

The aim is to stop the centipede from getting you, all the time keeping an eye out for the giant spider.

ALIEN CRESTA

\$21.50

The aim is to defend your ship from numerous attacks from an assortment of aliens. If you get hit three times, it's all over.

RALLY RACER

\$20.95

Drive through an action packed maze and try to hit all the flags before Morgan the Mad motorist or Crazy Harry and his killer hoodlums catch you!

SPECIAL OFFER

Buy any two games on this page and pay
only \$35 SAVE \$6

NOTE:

As the prices of imported software may vary, these prices are valid for current stock only and prices are subject to change without notice.

Double Your Disk Storage Capacity with the **LNDoubler 5/8**

The LNDoubler is easily installed into your expansion interface and provides support for both 5½" and 8" disk drives. Completely compatible with all the major Disk Operating Systems, the LNDoubler provides technically advanced, tested and reliable double-density operation with such features as:

- Analog phase lock loop data separation.
- Precision write precompensation.
- High quality PCB with all contacts gold-plated.
- Drives 1-3 may be software selected
- as 5" or 8" drives and a switch is provided for drive 0.
- Supports any mix of 5" or 8" drives, single or double density, single or double sided.

The LNDoubler will increase the formatted storage capacity of **each** 40 track single-sided drive by 80% to over 180Kbytes — for just over half the cost of one disk drive. With an 8 inch double-sided double-density disk drive, you can have over one Megabyte of online storage!

The LNDoubler 5/8 doubler with documentation is available for ...

\$285 plus \$2.00 p&p.

NOTE: A special cable is required for 8" drive operation and 8" double-density operation requires a 3.55 MHz CPU speed-up modification.

now available ...

DOSPLUS 3.5

is the state of the art in Disk Operating Systems for the Model 1 and Model 3 offering an order of magnitude increase in flexibility and performance over its predecessor DOSPLUS 3.4 and yet, is easier to use and more friendly with a Help facility explaining the syntax of DOS commands. The huge manual of over 350 pages describes the system in detail and is sectioned and tagged so that you can find what you want more quickly. Far greater flexibility is offered by the introduction of device drivers that are external to the system and that can be tailored to your needs.

Some of the features offered by DOSPLUS 3.5 are ...

- Single and double density support with density recognition.
- Improved file control facilities and date stamping of files.
- A keyboard driver that offers single key entry.
- An extensive Job Control Language.
- Complete and detailed technical system information.
- Two versions of BASIC, plus a BASIC label facility.
- and much more.

| DOSPLUS 3.5 REPRESENTS EXCELLENT VALUE AT \$160

When ordering by MAIL please specify Model 1 or Model 3 and include \$2 for freight

DISK DRIVE HEADS CLEANING DISKETTES \$44 incl p. & p.

Disk drives are expensive and so are diskettes. As with any magnetic recording device, a disk drive works better and lasts longer if the head is cleaned regularly. In the past, the problem has been, how do you clean the head without pulling the mechanism apart and running the risk of damaging delicate parts. 3M has come to our rescue with SCOTCH BRAND, non-abrasive head cleaning diskettes which thoroughly clean the head in seconds. The cleaning action is less abrasive than an ordinary diskette and no residue is left behind. Each kit contains:

- 2 head cleaning diskettes
- 1 bottle of cleaning fluid
- 1 bottle dispenser cap

5" FLOPPY DISKETTES 3M Scotch Brand

- Reinforced centre hole
- To suit soft sector format
- Rated for double density

Box of 10 single-sided for
\$59 incl p. & p.

Box of 10 double-sided for
\$69 incl p. & p.

**FIT A PERCOM
DATA SEPARATOR
and eliminate CRC
errors and locked-out
tracks**

\$45 plus \$2 p. & p.

When Tandy designed the TRS-80 expansion interface, they did not include a data separator in the disk-controller circuitry, despite the I.C. manufacturer's recommendations to do so. The result is that many disk drive owners suffer a lot of Disk I/O errors. The answer is a data separator. This unit fits inside your expansion interface. It is supplied with full instructions and is a must for the serious disk user.

HARDWARE KITS

Are you the do-it-yourself type? Then these kits are for you

PCG-80 Hiresolution Graphics Board

The ultimate hi-resolution graphics board for the TRS-80 Model 1 and System 80 that provides 256 programmable characters as well as the ability to emulate a 384 x 192 dot addressable screen. The hardware capabilities of the PCG-80 enable you to plot mathematical functions, display arcs, circles, lines, waves and design and display custom characters ranging from 72 pixels to 18432 pixels. You can mix graphics and characters anywhere on the screen.

PCG-80 to suit Model 1 only **\$199**

plus \$5 p. & p.

PCG-80 to suit System 80 only **\$219**

plus \$5 p. & p.

(Note: Not suitable for later type Japanese keyboards on TRS-80 Model 1).

16K Memory Upgrade Kit **ONLY \$25**

plus \$2.00 p. & p.

Large volume means we can buy better and can pass the savings on to you. There are our proven, prime, branded 200 nanosecond chips, guaranteed for 12 months.

A pair of DIP shunts is also required to upgrade CPU memory in the TRS-80 — these cost an additional \$4.00. All kits come complete with full, step-by-step instructions which include labelled photographs. No soldering is required. You do not have to be an experienced electronic technician to install them.

Typewriter Interface Kit

The MICRO-80 Interface does not interfere with the normal operation of your Praxis 35 or ET-121 typewriter which becomes a reliable, high quality, letter perfect printer. We are convinced that you will be able to fit the Interface yourself without hassles and be printing within the hour. Our interfaces provide a Centronics compatible parallel interface and are supplied with power supply, comprehensive fitting instructions and user manual. The cable to connect the interface to the computer is not included in the price. We also offer a fitting service in Adelaide for only \$35.

Interface to suit Praxis 35 only **\$300**

plus \$10 p. & p.

Interface to suit ET-121 only **\$375**

plus \$10 p. & p.

Lower Case Modification

\$49

plus \$2.00 p. & p.

The MICRO-80 modification features true below-the-line descenders, a block cursor and symbols for the 4 playing-card suits. Each kit comes with comprehensive fitting instructions and two universal lower-case driver routines on cassette to enable you to display lower case. These routines are self-relocating, self-protecting and will co-reside with other machine language programs (the second includes keyboard-debounce and flashing cursor). Fitting requires soldering inside the computer and should only be carried out by an experienced hobbyist or technician. A fitting service is available in capital cities for only \$20.00 and a list of installers is included with each kit. (Specify TRS-80 Model 1 or System 80 when ordering.)

DISK OPERATING SYSTEMS & DEVELOPMENT SOFTWARE

You can increase your programming productivity, the execution speed and 'user friendliness' of your programs by using an enhanced Disk Operating System (DOS). Together with the other utility software, you can get the most from your disk drives. Note: For DOSes, include \$2.00 for freight.

DOSPLUS 3.5 (Specify Model I or Model III)	\$160.00	NEWDOS 80 VERSION 2.0 (Specify Model I or Model III)	\$185.00
DOSPLUS 3.5 is a powerful, sophisticated DOS intended for the experienced user. The system can be configured to suit your requirements, provides greatly enhanced features over 3.4 and new features like single-key entry, date-stamping of files, a Help file and more. More user friendly than 3.4, DOSPLUS 3.5 comes with a very extensive stand-alone manual.		Newdos 80 suits the experienced user who has already used TRSDOS, understands the manual and is prepared to learn the somewhat complicated syntax of one of the most powerful DOS's available. With the correct hardware, Newdos 80 supports any mix of single- or double-sided, single or double density, 5" or 8" disk drives with track counts up to 98. It provides powerful, flexible file handling in BASIC including variable length records up to 4096 bytes. Definitely not for the beginner.	
BMON by Edwin Paay The ultimate High Memory Basic Monitor L2/16-48K	\$20.50	MASTER DISK DIRECTORY	\$20.95
BMON Renumbers; Displays BASIC programs on the screen while they are still loading; tells you the memory locations of the program just loaded; lets you stop a load part-way through; merges two programs, with automatic renumbering of the second so as to prevent any clashes of line numbers; recovers your program even though you did type NEW; makes one program invisible while you work on a second (saves hours of cassette time!); lists all the variables used in the program; makes SYSTEM tapes; lets you Edit memory directly ... the list goes on and on. Cassette comes with 16K, 32K and 48K versions, ready to load. Can anyone afford NOT to have BMON?		FIND THE PROGRAM FAST!! PAYS FOR ITSELF BY RELEASING REDUNDANT DISK SPACE!! MASTER DIRECTORY records the directories of all your individual disks onto one directory disk. Then it allows you examine them, find an individual file quickly, list files alphabetically, weed out redundant files, identify disks with free space, list files by extension, etc, etc. This program is invaluable for the serious disk user and will pay for itself many times over. Not fully compatible with NEWDOS 80.	

THE FLOPPY DOCTOR/MEMORY DIAGNOSTIC Model III Disk \$43.50

THE MICRO CLINIC offers two programs designed to thoroughly check out the two most trouble-prone sections of the TRS-80 - the disk system (controller and drives) and the memory arrays. Both programs are written in Z80 machine code and are supplied together on diskette for a minimum 32K, one disk system.

COLOUR COMPUTER SOFTWARE

For Tandy Colour Computers with at least 16K of memory, choose from the following selection:

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multiples them, converts this value into a string value, and puts it in the array. Lines 330, 390 and 420 prevent inappropriate data entering the matrix. Line 330 also assigns a value in I(N) to each row of the string matrix. This array is used later when ordering the data.

Lines 450 to 570 echo the data (using lines 680 to 760) and allow lines to be added or changed, and are quite straightforward.

Perhaps the most important part of the program is found in lines 770 to 840 which arranges the values in descending order. Variable T sets the values to be compared in line 800, but it is not these values which are transposed in line 810. The values in the I(N) array are transposed instead. And the display subroutine of lines 680 to 760 prints the rows of data corresponding to the new order of I(N).

Lines 850 to 940 are a Screenprint subroutine. LN is used as a linecounter since the lineprinter counts only one line for a full scan of the screen. Lines 950 to 970 are a pagination subroutine, with the values set for A4 size pages.

Lines 980 to 1050 are NOT used in the usual running of the program. They are used only when developing and testing the program to avoid having to enter data by hand. They are called by line 320 which should be deleted when the program has been debugged.

- 0000000000 -

**** TOWERS OF HANOI ****

COLOUR COMPUTER

```

10 'THE TOWERS OF HANOI
20 '           BY
30 '           MICHAEL BYRNE
40 CLEAR 93
50 CLS(0):GOSUB 1430:GOSUB 1510:
MAX=8
60 DIM N(3),P1(MAX),P2(MAX),P3(M
AX),SK(10*MAX)
70 SC=1:AL=2:DN=3:CT=0:P1(0)=99:
P2(0)=99:P3(0)=99
80 NM=0:J=0:I=0:SP=0:B=0:CLS
90 INPUT"How many discs do you
want":CT
100 IF CT> MAX THEN PRINT"Maximum
number is 8":GOTO 90
110 IF CT<=0 THEN PRINT"Sorry,
that's not possible":GOTO 90
120 IF CT<=3 THEN PRINT"You have
no sense of adventure but I su
ppose you have to start somewhere
else"
130 N(1)=CT:N(2)=0:N(3)=0
140 INPUT"Automatic or manual (A
or M)":MODE$
150 IF MODE$<>"A" GOTO 270
160 PRINT"How fast":INPUT" (0 is
fastest, 10 is slowest)":S
170 CLS:GOSUB1150
180 GOSUB530:SP=4
190 SK(SP-3)=CT:SK(SP-2)=SC:SKK(
SP-1)=DN:SK(SP)=AL
200 B=SP:SP=SP+4
210 SK(SP-3)=SK(B-3):SK(SP-2)=SK(
B-2):SK(SP-1)=SK(B-1):SK(SP)=SK(
B)
220 IF CT< >1 THEN GOTO 250
230 SP=SP+2:SK(SP-1)=1:SK(SP)=3:
GOSUB 580
240 GOTO260
250 GOSUB 810
260 PRINT#416,"";:GOT0500
270 CLS:GOSUB 1150:S=0
280 GOSUB 530
290 PRINT#416,"";

```

```

300 PRINT#416,"FROM PEG";:INPUT
F
310 PRINT#430,"TO PEG";:INPUT T
320 IF F<1 OR T<1 OR F>3 OR T>3
THEN PRINT"NO SUCH PEG":GOTO 290
330 IF F=T THEN PRINT"NOT ALLOWED":GOTO 290
340 IF N(F)<=0 THEN PRINT"there
are no discs on peg ";F:GOTO290
350 I=N(F):J=N(T)
360 ON F GOTO 370,400,420
370 T1=P1(I)
380 IF T=2 THEN T2=P2(J):ELSE T2
=P3(J)
390 GOTO 430
400 T1=P2(I):IF T=1 THEN T2=P1(J)
:ELSE T2=P3(J)
410 GOTO 430
420 T1=P3(I):IF T=2 THEN T2=P2(J)
:ELSE T2=P1(J)
430 IF T1>T2 THEN PRINT"NOT ALLOWED":GOTO290
440 SP=SP+2:SK(SP-1)=F:SK(SP)=T
450 GOSUB 580
460 IF N(1)=0 AND N(2)=0 AND N(3)
=CT THEN GOTO 470:ELSE GOTO 290
470 M=2^CT-1:PRINT#416,"";
":PRINT#
416,"";
480 IF NM=M THEN PRINT"CONGRATULATIONS! YOU DID IT" ELSE IF NM-M
<=M*.15 THEN PRINT"NOT BAD AT ALL"
490 PRINT"YOU TRANSFERRED ALL THE DISCS IN ";NM;" MOVES
500 PRINT"CARE FOR ANOTHER GAME" :PRINT"(YES OR NO)";
510 INPUT AN$
520 IF AN$="N" OR AN$="NO"THEN CLS:POKE359,126:END ELSE GOTO80
530 J=CT
540 FOR I=1 TO CT
550 P1(I)=J:J=J-1:NEXT I
560 RETURN
570 'SHIFT DISCS
580 NM=NM+1:SE=SK(SP-1):DE=SK(SP)
590 FOR I=1 TO 30*S:NEXT I
600 I=N(SE):Y=23-(I*2)
610 IF SE< >1 THEN 630
620 TD=P1(I):X=10:GOTO 660

```

```

1180 NEXT I
1190 FOR I=1376 TO 1407:POKE I, 191:
NEXTI
1200 PRINT:PRINT" 1
1210 Y=21:X=10
1220 FOR I=CT TO 1 STEP -1
1230 FOR J=1 TO I
1240 SOUND 1081,1
1250 SET (X-J,Y,I):SET (X-J-1,Y,I)
:SET (X-J,Y-1,I):SET (X-J-1,Y-1,I)
1260 SET (X+J+2,Y,I):SET (X+J+1,Y,
I):SET (X+J+1,Y-1,I):SET (X+J+2,Y-
I,I)
1270 NEXT J
1280 Y=Y-2
1290 NEXT I
1300 RETURN
1310 'SWITCH PROCEDURE
1320 IF P=2 THEN 1390
1330 FOR J=1 TO SIZE
1340 C=SIZE
1350 SOUND 1086,1
1360 SET (X-J-1,Y,C):SET (X-J-1,Y-
1,C):SET (X+J+1,Y,C):SET (X+J+1,Y-
1,C):SET (X-J,Y-1,C):SET (X+J+2,Y-
1,C):SET (X-J,Y,C):SET (X+J+2,Y,C)
1370 NEXT J
1380 GOTO 1420
1390 FOR J=1 TO SIZE
1400 RESET (X-J-1,Y):RESET (X+J+1,
Y-1):RESET (X-J+1,Y):RESET (X+J+1,
Y-1):RESET (X-J,Y-1):RESET (X+J+2,
Y-1):RESET (X-J,Y):RESET (X+J+2,Y)
1410 NEXT J
1420 RETURN
1430 D$= STRINGS(32," ")
1440 PRINT#12B,D$
1450 PRINT D$:PRINT
1460 PRINT#231,"T H E T O W
E R S"
1470 PRINT#265,"O F H A N O I
",PRINT
1480 PRINT D$
1490 PRINT D$
1500 RETURN
1510 POKES59,57:SCREEN0,1:GOSUB1
900: FOR I=1 TO 1000:NEXT I
1520 PRINT#449,"INSTRUCTIONS (YE
S OR NO)":INPUT ANS
1530 IF ANS>"Y" AND ANS<>"YES"
" THEN RETURN
1540 CLS
1550 PRINT#10,"INSTRUCTIONS"
1560 PRINT#42,"-----":PRI
NT
630 IF SE<>2 THEN 650
640 TD=P2(I):X=32:GOTO 660
650 TD=P3(I):X=52
660 P=2:SIZE=TD
670 GOSUB 1320
680 I=N(DE)+1:Y=23-(I*2)
690 IF DE<>1 THEN 710
700 P1(I)=TD:X=10:GOTO 740
710 IF DE<>2 THEN 730
720 P2(I)=TD:X=32:GOTO 740
730 P3(I)=TD:X=52
740 P=1
750 GOSUB 1320
760 N(SE)=N(SE)-1
770 N(DE)=N(DE)+1
780 SP=SP-2
790 PRINT#220,"MOVE " ;NP:
800 RETURN
B10 'HANDI (RECURSIVE PROCEDURE)
820 IF SK(SP-3)>2 THEN GOTO B30
ELSE GOTO 1000
B30 B=SP:SP=SP+4
840 SK(SP-3)=SK(B-3)-1
850 SK(SP-2)=SK(B-2)
860 SK(SP-1)=SK(B)
870 SK(SP)=SK(B-1)
880 GOSUB B10
B90 B=SP:SP=SP+2
900 SK(SP-1)=SK(B-2)
910 SK(SP)=SK(B-1)
920 GOSUB 580
930 B=SP:SP=SP+4
940 SK(SP-3)=SK(B-3)-1
950 SK(SP-2)=SK(B)
960 SK(SP-1)=SK(B-1)
970 SK(SP)=SK(B-2)
980 GOSUB B10
990 GOTO 1120
1000 B=SP:SP=SP+2
1010 SK(SP-1)=SK(B-2)
1020 SK(SP)=SK(B)
1030 GOSUB 580
1040 B=SP:SP=SP+2
1050 SK(SP-1)=SK(B-1)
1060 SK(SP)=SK(B-1)
1070 GOSUB 580
1080 B=SP:SP=SP+2
1090 SK(SP-1)=SK(B)
1100 SK(SP)=SK(B-1)
1110 GOSUB 580
1120 SP=SP-4
1130 RETURN
1140 'DRAMPEGS
1150 CLB(O):REM ' PROC DRAMPEGS
1160 FOR I=1 TO 8
1170 POKE1093+I*32,191:POKE1104+
1180 POKE1114+I*32,191

```

```

11800 PRINT" AFTER ALL THAT IS WHA
11801 T IT IS THERE FOR ." :PRINT:GOS
11802 U1870:CLS
11810 PRINT"FOR A GIVEN NUMBER O
11811 F DISCS, N, THE SMALLEST NUMBER
11812 F MOVES REQUIRED IS GIVEN BY
11813 ":"-"
11820 PRINT" M = 2^N-1"
11830 PRINT"SO FOR 3 DISCS THAT'S
11831 7 MOVES, 4 DISCS 15 MOVES UP T
11832 H THE MAX OF 8 DISCS WHICH REGU
11833 LURES 255 MOVES." :PRINT
11840 PRINT" HAVE FUN!" RETURN
11850 GOSUB 1870
11860 RETURN
11870 PRINT@480, "PRESS <ENTER> W
11871 HEN READY";
11880 INPUT D$:CLS
11890 RETURN
11900 FORX=22T041:SET(X,7,3):SET(X,6,3):SET(X,24,3):SET(X,25,3):SET(X,23,Y,3):SET(22,Y,3):SET(40,Y,3)
11901 :SET(41,Y,3):Y=Y+1:NEXT
11910 FORX=24T039:FORY=8T023:SET(X,Y,6):NEXT
11911 :NEXT
11912 :NEXT
11913 :NEXT
11914 :NEXT
11915 :NEXT
11916 :NEXT
11917 :NEXT
11918 :NEXT
11919 :NEXT
11920 :NEXT
11921 :NEXT
11922 :NEXT
11923 :NEXT
11924 :NEXT
11925 :NEXT
11926 :NEXT
11927 :NEXT
11928 :NEXT
11929 :NEXT
11930 :NEXT
11931 :NEXT
11932 :NEXT
11933 :NEXT
11934 :NEXT
11935 :NEXT
11936 :NEXT
11937 :NEXT
11938 :NEXT
11939 :NEXT
11940 :NEXT

```

```

***** OTHELLO *****
COLOUR COMPUTER

10   *****
11   * (C) S.GIBBONS *
12   * 34 THE COMENARRA *
13   * PARKWAY, THORNLEIGH *
14   * N.S.W. 2120 *
15   *****

16   120 CLS
17   30 PRINT" OTHELLO":P
18   30 PRINT:PRINT
19   40 FORE=255TO1STEP-20: SOUNDE, 1:N
20   50 PRINT"DO YOU NEED INSTRUCTION
21   5?" :FORE=255TO1STEP-20: SOUNDE, 1
22   60 IF INKEY$= "Y" THEN GOTO126
23   60 ELSE IF IFS= "N" THEN GOTO680
24   70 GOTO60
25   80 CLS
26   90 GH=2

27   100 POKE1036, 15:POKE1037, 20:POKE
28   1038, 8:POKE1039, 5:POKE1040, 12:PO
29   KE1041, 12:POKE1042, 15
30   110 Y=6

31   200 PRINT#448, "CL$;
32   240 IF GH=2 THEN PRINT#448, "", ;: IN
33   PUT"BLACK'S TURN", A, B; C=0:OC=5
34   ENPRINT#448, "INVALID MOVE"; :FORE
35   =1101000:NEXT:GOTOD230
36   280 GH=GH+1:IF GH>2THEN GH=1
37   290 X=2*(A+12)-1:Y=2*(B+3)
38   300 IF POINT(X, Y)=5 OR POINT(X, Y
39   )=0 THEN PRINT#448, "INVALID MOVE"
40   1:FORE=1TO1000:NEXT:IF C=0 THEN
41   GH=2:GOTOD230ELSE GH#4:GOTOD230
42   310 IF POINT(X+2, Y+2)=5 OR POINT
43   (X+2, Y+2)=0 OR POINT(X-2, Y+2)=0
44   OR POINT(X-2, Y+2)=5 OR POINT(X-2
45   , Y-2)=0 OR POINT(X-2, Y-2)=5 THEN
46   ABC=1ELSE ABC=0
47   320 IF ABC=1 OR POINT(X+2, Y-2)=5
48   OR POINT(X+2, Y-2)=0 OR POINT(X-
49   2, Y)=0 OR POINT(X-2, Y)=5 OR POIN
50   T(X+2, Y)=0 OR POINT(X+2, Y)=5 OR
51   POINT(X, Y-2)=5 OR POINT(X, Y-2)=0
52   OR POINT(X, Y+2)=0 OR POINT(X, Y+
53   2)=5 THEN GOTO80
54   350 PRINT#448, "INVALID MOVE"; :FO
55   RE=1TO1000:NEXT:IF GH=2THEN GH=1:G
56   OTOD230ELSE GH#2:GOTOD230
57   600 IF POINT(X, Y)=C THEN GOTO10 EL
58   680
59   610 N=X
60   620 N=N+1:IF N>40 OR POINT(N, Y)=6
61   THEN GOTO680
62   630 IF POINT(N, Y)=C THEN GOTO680
63   20
64   640 N=X
65   650 N=N+2:SOUND254, 1:IFPOINT(N, Y
66   )=C THEN GOTO680

```

```

640 IF C=5 THENSET (N, Y, 5) : SET (N-
1, Y, 5) : SET (N, Y+1, 5) : SET (N-1, Y+1,
5) ELSE RESET (N, Y) : RESET (N-1, Y) : RE-
SET (N, Y+1) : RESET (N-1, Y+1)
650 GOTO450
660 IF POINT (X+2, Y-2)=OC THEN760
OELSE760
690 N=X: M=Y
700 N=N+2: M=M-2: IF M<6 OR N>40 O
R POINT (N, M)=6 THEN 760
710 IFPOINT (N, M)=C THEN720ELSE70
O
720 N=X: M=Y
730 N=N+2: M=M-2: SOUND255, 1: IFPD1
NT (N, M)=C THEN760
740 IF C=5 THENSET (N, M, 5) : SET (N-
1, M, 5) : SET (N, M+1, 5) : SET (N-1, M+1,
5) ELSE RESET (N, M) : RESET (N-1, M) : RE-
SET (N, M+1) : RESET (N-1, M+1)
750 GOTO730
760 GOSUB930
770 GOTO830
780 GOTO350
790 SET (X, M, 5) : SET (X-1, M, 5) : SET (
X, M+1, 5) : SET (X-1, M+1, 5) : RETURN
800 RESET (X, M) : RESET (X-1, M+1) : RETURN
T (X, M+1) : RESET (X, M) : RETURN
810 SET (N, M, 5) : SET (N-1, M, 5) : SET (
N, M+1, 5) : SET (N-1, M+1, 5) : RETURN
820 RESET (N, M) : RESET (N-1, M) : RESE-
T (N, M+1) : RESET (N-1, M+1) : RETURN
830 WHS=0: BLS=0: SP=0
840 FORX=22TO40STEP2: FORY=8T0248
TEP2
850 IFPOINT (X, Y)=0 THENBL S=BL S+1
860 IF POINT (X, Y)=6 THENSP=SP+1
870 IFPOINT (X, Y)=5 THENWHS=WHS+1
880 NEXT: NEXT
890 PRINT352+21, "WHITE: "; WHS;
900 PRINT364+21, "BLACK: "; BLS;
910 IF SP=0 THEN1190
920 GOTO230
930 IF POINT (X-2, Y-2)=OC THEN940
ELSE1010
940 N=X: M=Y
950 M=M-2: N=N-2: IFM<6 OR M<23 OR
POINT (N, M)=2 THEN1010
960 IFPOINT (N, M)=C THEN970ELSE9
50
970 N=X: M=Y
980 M=M-2: N=N-2: SOUND249, 1: IFPO1
NT (N, M)=C THEN1010
990 IFC=5 THENGOSUB810 ELSE 60SU
BB20
1000 GOTO980

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```

1010 IF POINT (X+2, Y+2)=OC THEN10
20ELSE1090
1020 N=X: M=Y
1030 M=M+2: N=N+2: IF M>23 OR N>40
OR POINT (N, M)=6 THEN1090
1040 IF POINT (N, M)=C THEN1050ELS
E1030
1050 N=X: M=Y
1060 M=M+2: N=N+2: SOUND248, 1: IFPO
INT (N, M)=C THEN1090
1070 IF C=5 THENGOSUB810ELSEGOSU
BB20
1080 GOTO1060
1090 IF POINT (X-2, Y+2)=OC THEN11
OELSE1170
1100 N=X: M=Y
1110 N=N-2: M=M+2: IFNK<21 OR M>23
OR POINT (N, M)=6 THEN1170
1120 IF POINT (N, M)=C THEN1130ELS
E1110
1130 N=X: M=Y
1140 M=M+2: N=N-2: SOUND247, 1: IFPO
INT (N, M)=C THEN1170
1150 IF C=5 THENGOSUB810ELSEGOSU
BB20
1160 GOTO1140
1170 ,
1180 RETURN
1190 PRINT3448, "", ;
1200 IFBLS>WHS THENPRINT "BLACK W
INS BY"; BLS-WHS; "POINTS.";
1210 PRINT "WHITE WINS BY"; WHS-BL
S; "POINTS.";
1220 FORE=1TD4000:NEXT:PRINT3448
,CL$;
1230 PRINT344B, "ANOTHER GAME??";
1240 I$=INKEY$: IFI$="Y" THENRUN
1250 IFI$="N" THENENDELSE1240
1260 CLS
1270 PRINT" " OTHELLO"
1280 GOSUB1640
1290 PRINT" OTHELLO IS A GA
ME OF STRATEGY FOR TWO PLAYERS
" IT CONSISTS OF 64 DOUBLE SIDED
DISCS (IN THIS CASE SQUARES) W
HICH ARE BLACK OR WHITE WHICH
ON ONE SIDE AND
WHITE ON THE
OTHER."
1300 GOSUB1640
1310 PRINT" EACH PLAYER CHOOSES H
IS COLOUR BLACK OR WHITE WHICH
IS HIS COLOUR THROUGHOUT THE
GAME. THE GAME STARTS WITH
FOUR DISCS IN THE MIDDLE, TWO OF
EACH EACH COLOUR CROSSING
EACH OTHER. "
1320 GOSUB1640
1330 PRINT344B, "HIT <SPACEBAR> T
O CONTINUE."
1340 GOSUB1640
1350 I$=INKEY$: IFI$=" " THEN1360
LSE1350
1360 GOSUB1650:CLS
1370 PRINT" OTHELLO"
1380 GOSUB1640
1390 PRINT "BLACK ALWAYS STARTS F
IRST."
1400 PRINT "A MOVE CONSISTS OF O
UTFLANKING YOUR OPPONENTS DISCS(S
) THEN FLIPPING THE OUTFLANK-
ED DISC(S) OVER TO YOUR COLOUR (
WHICH THE COMPUTER DOES FOR YOU
)."
1410 GOSUB1640
1420 PRINT
1430 PRINT "TO PLACE A DISC GIVE
THE 'X' COORDINATE FOLLOWED B
Y A COMMA ', ' THEN THE 'Y' COOR-
DINATE."
1440 GOSUB1640
1450 PRINT344B, "HIT <SPACEBAR> T
O CONTINUE"
1460 GOSUB1640
1470 I$=INKEY$: IFI$=" " THEN1480E
LSE1470
1480 GOSUB1650:CLS:PRINT"
OTHELLO":PRINT
1490 GOSUB1640
1500 PRINT "TO OUTFLANK MEANS TO
PLACE A DISC SO THAT YOUR OPP
ONENTS ROW OF DISC(S) IS BORDERE
D AT EACH END BY A DISC OF YOUR
COLOUR."
1510 GOSUB1640
1520 PRINT "A DISC MAY OUTFLANK I
N ANY DIRECTION: HORIZONTAL
LY, VERTICALLY OR DIAGONA
LLY."
1530 GOSUB1640
1540 PRINT "A DISC MAY OUTFLANK I
N ANY NUMBER OF DIRECTDINS
AT THE SAME TIME. A DISC CAN ONLY
BE PLACED ONE SQUARE AWAY FROM
ANY DISC IN ANY DIRECTION FROM TH
E DISC."
1550 GOSUB1640
1560 D$=".....HIT <SPACE
BAR> FOR GAME OR <ENTER> FOR INS
TRUCTIONS AGAIN."
.
```

```

1570 FORZ=1 TO LEN(D$)
1580 I$:=INKEY$
1590 PRINT#44B+10,M10$(0$,Z,11)
1600 IF I$=" " THEN GOSUB1650:CLS:G
DT80
1610 IF I$=CHR$(13) THEN GOSUB1650:
CLS:GOTO1260
1620 FORE=1 TO 100:NEXT
1630 NEXT:GOTO1570
1640 FORE=255 TO 1 STEP -20: SOUNDE,1
:NEXT:RETURN
1650 FORE=1 TO 255 STEP 20: SOUNDE,1:
PRINT:NEXT:RETURN

***** TOWERS OF HANOI *****
HITACHI PEACH

10' ===== THE TOWERS OF HANOI =====
20' BY MICHAEL BYRNE
30' P.O. BOX 1826
40' CANBERRA CITY
50' A.C.T. 2601
70' CLEAR 93
80' CLS:GOSUB 1450:GOSUB 1530:MAX=10:SCRE
ENO:,1
90' DIM N(3),P1(MAX),P2(MAX),P3(MAX),SK(1
0$MAX)
100' SC=1:AL=2:DN=3:CT=0:P1(0)=99:P2(0)=9
9:P3(0)=99
110' NM=0:J=0:I=0:SP=0:B=0:CLS
120' INPUT"How many discs would you like"
;CT
130' IF CT>MAX THEN PRINT"that will take
some time and first you will have to cha
nge line 10":END
140' IF CT<=0 THEN PRINT"Sorry, that's no
t possible":GOTO 120
150' IF CT<=3 THEN PRINT"you have no sense
of adventure - but i suppose you have to
start somewhere"
160' N(1)=CT:N(2)=0:N(3)=0
170' PRINT:PRINT"AUTOMATIC OR MANUAL (A O
R M)":GOSUB2050
180' IF IN$<>"A" GOTO 300
190' PRINT:INPUT"How fast (0 is fastest,
0 is slowest)":S
200' CLS:GOSUB1180
210' GOSUB560:SP=4
220' SK(SP-3)=CT:SK(SP-2)=SC:SKK(SP-1)=DN
:SK(SP)=AL

```

```

230' B=SP:SP=SP+4
240' SK(SP-3)=SK(B-3):SK(SP-2)=SK(B-2):SK
(SP-1)=SK(B-1):SK(SP)=SK(B)
250' IF C1<>1 THEN GOTO 280
260' SP=SP+2:SK(SP-1)=1:SK(SP)=3:GOSUB 61
0
270' GOTO290
280' GOSUB 840
290' LOCATE7,16:PRINT"";:GOT0530
300' CLS:GOSUB 1180:S=0
310' GOSUB 560
320' LOCATE7,18:PRINT"
"
330' LOCATE7,18:PRINT"FROM PEG";:INPUT F
340' LOCATE35,18:PRINT"TO PEG";:INPUT T:L
OCATE20,19:PRINT"
"
350' IF F<1 OR T<1 OR F>3 OR T>3 THEN PRIN
T"NO SUCH PEG
320
360' IF F=T THEN PRINT"NOT ALLOWED
370' IF N(F)<OTHERPRINT" THERE ARE NO DIS
CS DN PEG ";F:GOT0320
380' I=N(F):J=N(T)
390' ON F GOTD 400,430,450
400' T1=P1(I)
410' IF T=2 THEN T2=P2(J):ELSE T2=P3(J)
420' GOTO 460
430' T1=P2(I):IF T=1 THEN T2=P1(J):ELSE T
2=P3(J)
440' GOTO 460
450' T1=P3(I):IF T=2 THEN T2=P2(J):ELSE T
2=P1(J)
460' IF T1>T2 THEN PRINT"NOT ALLOWED
"
470' SP=SP+2:SK(SP-1)=F:SK(SP)=T
480' GOSUB 610
490' IF N(1)=0 AND N(2)=0 AND N(3)=CT THE
N GOTO 500:ELSE GOTD 320
500' M=2^CT-1:LOCATE7,1:PRINT"
"
:LOCAT
E7,18:PRINT"";
510' LOCATE1,19:IF NM=M THEN PRINT"CONGRAT
ULATIONS! YOU DID IT" ELSE IF NM-M<0.
15 THEN PRINT"NOT BAD AT ALL"
520' LOCATE1,20:PRINT"YOU TRANSFERRED ALL
THE DISCS IN " ;NM; " MOVES
530' LOCATE1,21:PRINT"CARE FOR ANOTHER GA
ME (YES OR NO)" ;
540' GOSUB2050:AN$=IN$
550' IF AN$="N" THEN CLS:END ELSE GOTO110
560' J=CT
570' FOR I=1 TO CT
580' P1(I)=J:J=J-1:NEXT I
590' RETURN

```

```

1140 GOSUB 610
1150 SP=SP-4
1160 RETURN
1170 ===== ORAMP EGGS
1180 CLS: PROC DRAPPEGS
1190 LOCATE7,6:PRINT" ";A$=CHR$(142)+CHR$(142)
1200 FOR I=1 TO 10
1210 LOCATE7,6+I: PRINT" ";A$;""
1220 NEXT I
1230 PRINT" "
1240 FOR I=1 TO 25:PRINT A$;:NEXT I
1250 PRINT:LOCATE7,4 :PRINT" "
1260 Y=16:X=17
1270 FOR I=CT TO 1 STEP -1
1280 FOR J=1 TO I
1290 LOCATEX-J,Y:PRINTCHR$(142);
1300 LOCATEX-J+2,Y:PRINTCHR$(142);
1310 NEXT J
1320 Y=Y-1
1330 NEXT I
1340 RETURN
1350 ===== SWITCH PROCEDURE
1360 IF P=2 THEN 1410
1370 FOR J=1 TO SIZE
1380 LOCATE-X-J,Y:PRINTCHR$(142);:LOCATE
    +J+2,Y:PRINTCHR$(142);
1390 NEXT J
1400 GOTO 1440
1410 FOR J=1 TO SIZE
1420 LOCATE7,7:PRINTD$;
1470 LOCATE7,8: PRINT D$:PRINT
    J+2,Y:PRINTCHR$(32);
1430 NEXT J
1440 RETURN
1450 D$=STRING$(63,"*")
1460 LOCATE7,7:PRINTD$;
1470 LOCATE7,8: PRINT D$:PRINT
    R S"
1480 LOCATE25,10:PRINT"THE TOWE
    R S"
1490 LOCATE27,11:PRINT"OF H A N O I"
    :PRINT
1500 LOCATE7,13: PRINT D$
    1510 LOCATE7,14:PRINT D$
1520 RETURN
1530 FOR I=1 TO 1000:NEXT I
1540 LOCATE7,17:PRINT"DO YOU WANT 1 INSTRU
    CTIONS "(YES OR NO)":;GOSUB2050:AN$=IN$
1550 IF AN$<>"Y" THEN RETURN
1560 CLS
1570 LOCATE30,3:PRINT"INSTRUCTIONS"
1580 LOCATE30,4:PRINT" "
T

```

```

1930 PRINT"IS WHAT IT IS THERE FOR." :PRI
NT
1940 PRINT"FOR A GIVEN NUMBER OF DIS
CS, N, THE SMALLEST NUMBER OF"
1950 PRINT"MOVES REQUIRED IS GIVEN BY :-
"
1960 PRINT" M = 2^(N-1)
1970 PRINT"SO FOR 3 DISCS THAT'S 7 MOVES
1980 PRINT"THE MAXIMUM OF 10 DISCS WHICH
4 DISCS 15 MOVES UP TO"
1990 PRINT"REQUIRES 1023 MOVES." :PRINT
    HAVE FUN!"
2000 GOSUB 2020
2010 RETURN
2020 LOCATE7,18:PRINT"PRESS <RETURN> WHE
N READY";
2030 INPUT 0$:CLS
2040 RETURN
2050 IN$=1INKEY$:"THEN2050ELSE1N=V
AL (IN$):RETURN
=====
***** REGISTER DISPLAY *****
HITACHI PEACH
*****
10 ***** REGISTER DISPLAY PROGRAM ***
20
30
40 'Program Loads display routine in mac
hine
50 'Language format at selected location
    in
60 'User RAM or a default location at
    6F90
70 'top of User RAM).
80 '
90 'The program runs after loading and g
ives
100 'a sample display.
110 '
120 SCREEN 0,,0:CLEAR 300,&H6F00
130 PRINT"Insert RAM store location :xxx
x :or DEFT"
150 1F A$="DEFT" THEN A$="&H6F90" ELSE A
$="&H"+A$)
140 A$=1INPUT$(4)
1540 LOCATE30,4:PRINT"-----":PRINT
    "IF YOU ARE UNSURE OF THE
    GAME TRY AUTOMATIC OPERATION"
1550 PRINT"WITH ABOUT FOUR DISCS AND LOW
    SPEED (E.G. 10). THEN SIT"
1560 PRINT"BACK AND LET THE COMPUTER DO
    ALL THE WORK - AFTER ALL THAT"
1570 FOR I=0 TO 103
1580 READ B$

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```

200 POKE VAL(A$)+I,VAL(("&H"+B$))
210 NEXT I
220 DATA B6,7E,B7,01,06,3F,39,3F,BD,A4,4
   ,3F,BD
230 DATA DC,E6,33,6C,34,40,1F,43,86,53,B
D,EB,20
240 DATA BD,40,A6,CO,BD,DD,32,A6,CO,BD,D
D,32,BD
250 DATA BO,BE,BE,DE,20,BD,DE,31,A6,CO,BD,D
D,DD,32
260 DATA BD,1D,A6,84,B1,58,26,FO,B1,45,2
7,23,BD
270 DATA DE,31,A6,CO,BD,DD,32,A6,CO,BD,D
D,32,BD
280 DATA OA,A6,B4,20,E9,BD,B1,16,BD,B1,1
6,BD,B1
290 DATA 16,BD,B1,16,BD,B1,16,39,35,40,3
5,FF,00
300 EXEC VAL(A$)
310 END

DRG      $6790    INITIALISE SWI VECTOR IN C/W
         LDA      #7E      BASIC LINES 160 AND 170
         STA      >$0106   RETURN TD PROGRAM

SWI      >$A440    RETURN TD BASIC
         RTS
         SWI      >$DCE6    RETURN TD MON
         JSR      LEAU      CALCULATE ORIGINAL STACK PDINTER
         PSHS      U        SAVE IT
         TFR      S,U      STACK PDINTER: S TD U
         LDA      #53      CHARACTER S
         JSR      >EB20    PRINT S
         BSR      SPC2      2 SPACES
         LDA      ,U+      2 BYTES FROM STACK
         JSR      >DD32    AND PRINT
         LDA      ,U+
         JSR      >DD32    CR/LF
         LDX      #DE20    PDINT TD REGISTER HEADINGS TABLE
         JSR      >DE31    PRINT HEADINGS AND SPACE
         LDA      ,U+
         JSR      >DD32    1 BYTE FROM STACK AND PRINT
         BSR      SPC5    TD 6F3: 5 SPACES
         LDA      ,X      TEST FOR END OF 1 BYTE REGS.
         CMPA     #5B      EXIT
         BNE      RDPI    TD 6FBC
         CMPA     #45      TESTS FOR END OF HEADINGS
         BEQ      >DE31    TD 6F3 AND EXIT
         JSR      >DE31    PRINTS REG. HEADING AND SPACE
         LDA      ,U+
         JSR      >DD32    PRINTS 2 BYTES FROM STACK
         LDA      ,U+      AFTER COMMAND 6, — YOU DIE — !!

JSR      >*DD32    TD 6FEC: 2 SPACES
         BSR      LDA      *X      RDP2    TD 6FCC
         BRA      SPC5    JSR      >B116
         JSR      SPC2    JSR      >B116
         JSR      RTS     U      DISCARD SP
         PULS    CC,A,B,DP,X,Y,U,PC
         END     PULS    RESTORE REGS. AND SP

**** L2/16K DESERT CHASE ****
TR80/SYSTEM-80

10 REM ----- WRITTEN BY: ANDREW N. DOMNEY -----
20 CLS:RANDOM:PRINT@0,CHR$(23); "PLEASE STAND BY "
30 CLEAR(1300):DIM C$(51):DEFINTA-Z:GOSUB1000:R=RND(100)+200
40 CLS:PRINTTAB(25); "DESERT CHASE":PRINTTAB(25); "===== =====";
PRINT@256,"WOULD YOU LIKE INSTRUCTIONS";
50 K$=INKEY$:IFK$=""THEN50ELSEIFK$="N"THEN120
60 PRINT@12B,CHR$(30);
70 PRINT"
WELCOME TO 'DESERT CHASE'. THE OBJECT IS TO TRAVEL ACROSS THE
VAST SIMPSON DESERT. THE DISTANCE VARIES BETWEEN 200 MILES &
300 MILES. A LARGE TRIBE OF HOSTILE NATIVES IS RUMORED TO BE
IN EXISTENCE AND IS SURE TO CHASE YOU."
80 PRINT"
YOU HAVE BEEN GIVEN A SINGLE HUMP CAMEL - CHARLES C. CAMEL -
TD HELP YOU IN YOUR VENTURE."
90 PRINT"
WHEN ASKED FOR COMMANDS THE CURSOR WILL FLASH, AT THIS POINT,
PRESS KEY CORRESPONDING TO THE NUMBER REQUIRED."
100 PRINT"PRESS ANY KEY TD CONTINUE"
110 K$=INKEY$:IFK$=""THEN110
120 CLS:PRINT@,"D E S E R T - C H A S E"
C D M M A N D S :
#1 DRINK FROM WATERBAG
#2 CONTINUE SLOWLY
#3 AHEAD FULL SPEED
#4 REST FOR THE NIGHT
#5 CHECK SUPPLIES
#6 WAIT FOR HELP"
130 PRINT@512,""
YOU HAVE RENEWED YOUR WATER SUPPLY AT NEARBY WATER-HOLE AND HAVE
ONE LITRE OF WATER. THIS WILL LAST YOU SIX DRINKS. IF FOUND BY
HELP THEY WILL GIVE YOU 1/2 LITRE. IF HELP DOES NOT FIND YOU
AFTER COMMAND 6, — YOU DIE — !!"
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140 PRINT"THE MINISTRY OF THE INTERIOR AND I WISH YOU GOOD LUCK
!!"
150 GOSUB940
160 IF C>RTHEN630
170 Z=Z-1:IF Z=1PRINT"—" WARNING ----- YOU NEED A DRIN
K."
180 IF Z<0 THEN 880 ELSE P=P+1
190 X2=RND(10)+2.5:IF Q>OTHEN510
200 IF P<4THEN250
210 C1=C1+X2:IF C1<CTHEN240
220 FORD=1TO1000:NEXT:PRINT#512,CHR$(31);"
230 PRINT"THE NATIVES HAVE CAPTURED YOU. CAMEL AND PEOPLE SOUP IS"
240 PRINT"THEIR FAVORITE DISH!!!!:C4=7:GOSUB980:GOTO B40
250 IF C=0 THEN 260 ELSE PRINT@101,C;"DOWN -";R-C;"TO GO.";
260 IFT2<1THENC4=10
270 GOSUB980:GOSUB950:T2=1:PRINT#38,"ENTER YOUR COMMAND";;
280 Y$=INKEY$:IFY$<>"."THENZ90ELSEPRINT#38,CHR$(140);IFORD=1TD100
:NEXT:PRINT#58,CHR$(128);FORD=1TD100:NEXT:GOTD2B0
290 IF ASC(Y$)<49 OR ASC(Y$)>54 THEN 280 ELSE Y=VAL(Y$)
300 FORD=1TO200:NEXT:PRINT#56," ";PRINT#512,CHR$(31);
310 ON Y GOTO 460,340,380,410,430
320 T=RND(10):IFT<>1THEN740
330 C4=37:GOSUB980:PRINT#512,CHR$(31);"
330 C4=37:GOSUB980:PRINT#512,CHR$(31);"
HELP HAS FOUND YOU IN A STATE OF UNCONSCIOUSNESS. :"S=3:Z=4:GOTO1
60
340 F=F+1:IFF=8THEN620
350 GOSUB 480
360 X1=RND(10):C=C+X1:C4=1:GOSUB980
370 PRINT#512,CHR$(31);"
YOUR CAMEL LIKES THIS PACE":GOTO 160
380 F=F+3:IFF>7THEN620
390 GOSUB 480:X1=24RND(10):C=C+X1:C4=22:GOSUB980
400 PRINT#512,CHR$(31);"
YOUR CAMEL IS BURNING ACROSS THE DESERT SANDS":PRINT:GOTO 160
410 C4=1:GOSUB980:PRINT#512,CHR$(31);"
YOUR CAMEL THANKS YOU!:"
420 F=0:GOTO0170
430 PRINT"
YOUR CAMEL HAS "17-F" GOOD DAYS LEFT."
440 PRINT"YOU HAVE "IS1" DRINKS LEFT IN YOUR WATER-BAG."
450 PRINT"YOU CAN GO "IZ1" COMMANDS WITHOUT DRINKING.":GOTO0170
460 S=S-1:C4=31:GOSUB980:IFS<OPRINT#512,;:GOTD740
470 PRINT#512,"
BETTER MATCH FOR A WATER-HOLE !":Z=4:GOTD260
480 A=RND(100):IFA>5THEN600
490 C4=4:GOSUB980
500 PRINT#512,"WILD TRIBESMEN HIDDEN IN THE SAND HAVE CAPTURED Y
OU.
LUCKILY THE LOCAL ELDER HAS AGREED TO THEIR RANSOM
DEMANDS ..... BUT ..... WATCH FOR THE NATIVES!!
YOU HAVE A NEW CHOICE OF SUB-COMMANDS :"
510 PRINT"#7 ATTEMPT ESCAPE — ";

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520 INPUT">#B WAIT FOR PAYMENT --- SUB COMMAND " ;X:IFX<7ORX>BTTHEN
500 PRINT#512,CHR$(31);:IFX=BTHEN570
530 X1=RND(10):IFX1<5THEN560
550 PRINT"
CONGRATULATIONS, YOU SUCCESSFULLY ESCAPED!!!":Q=0:GOTO160
560 PRINT"YOU WERE MORTALLY WOUNDED BY A SPEAR WHILE ESCAPING.":C4=34:GOSUB980:GOTD840
570 X1=RND(100):IFX1>24THEN590
580 PRINT"
YOUR RANSOM HAS BEEN PAID AND YOU ARE FREE TO GO.":Q=0:GOTO160
590 PRINT"
THE LOCAL ELDERS ARE COLLECTING ... JUST WAIT ... ":FORD=1TO1000:
NEXT
600 A=RND(10):IFA>2THEN650
610 PRINT#512,CHR$(31);"
YOU HAVE ARRIVED AT A WATER-HOLE... YOUR CAMEL EATS HAPPILY WHILE YOU REFILL YOUR WATER-BAG":C4=13:GOSUB980:FOR
D=1TO2500:NEXT:Z=4:S=6:RETURN
620 C4=16:GOSUB980:PRINT#512;"
YOU IDIOTIC FOOL !!! YOU RAN YOUR POOR CAMEL TO DEATH!!!":GOTD740
630 PRINT#38,"YOU TRAVELED ";C;"MILES. ";PRINT@102,"VERY WELL
DONE !!!";
640 PRINT#512,CHR$(31);"
YOU WIN, A PARTY IS BEING GIVEN IN YOUR HONOR. ....":C4=2B:GDS
..... THE NATIVES ARE PLANNING TO ATTEND . ....
UB980:GOTD840
650 X1=RND(100):IFX1>5THEN720
660 C4=19:GOSUB980:PRINT#167,C*(C4);:PRINT#423,C*(C4);
670 PRINT#512;"
YOU HAVE BEEN CAUGHT IN A SANDSTORM... . GOOD LUCK!":FORD=1TO1000:
NEXT
680 X5=RND(100):X6=RNO(100):IFX6<50THEN710
690 C=C+X5:GOTD710
700 C=C-X5
710 PRINT"YOUR NEW POSITION IS ";C1" MILES SO FAR!":FORD=1TO1500
:NEXT:PRINT#167,STRING$(23,13);:PRINT#423,STRING$(23,176);:RETU
RN
720 X1=RND(100):IFX1>5RETURN
730 C1=C1+1:C4=25:GOSUB980:PRINT#512,CHR$(31);"
YOUR CAMEL HURT HIS HUMP.
LUCKILY THE NATIVES WERE FOOTWEARY!!!":FORD=1TO1500:NEXT:RETURN
740 U=RND(10):PRINT"
YOU DIED IN THE DESERT.":IFF>7GOTD840
750 IFU>1THEN770
760 PRINT"THE NATIONAL CAMEL'S UNION IS NOT ATTENDING YOUR FUNER
AL":C4=49:GOSUB980:GOTD840
770 IF U>3 THEN 790
780 PRINT"YOUR BODY WAS EATEN BY VULTURES AND IMPORTED CANNIBALS
":C4=4:GOSUB980:GOTD840
790 IF U>5 THEN B10
800 PRINT"THE LOCAL ELDER NOW USES YOUR SKULL FOR A MONEY PURSE!
":C4=43:GOSUB980:GOTD840
810 IF U>7 THEN B30
820 PRINT"PEOPLE WITH LITTLE INTELLIGENCE SHOULD STAY OUT OF THE
DESERT":C4=46:GOSUB980:GOTD840

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00300 WRITE      ; WRITES BYTE TO TAPE
00400 DISPLAY   ; DISPLAYS MESSAGE ON SCREEN
00500 SCREEN    ; START OF SCREEN MEM
00600 ENDSCR   ; END OF SCREEN MEM
00700 ENDPRG   ; END OF BASIC PROGRAM POINTER
00800 CLS       ; CLEARS SCREEN
00900 GETCHR   ; GETS KEY DEPRESSED
01000 GETVAL   ; GETS INPUT VALUE
01100 RECON    ; TURNS RECORDER ON
01200 RECOF    ; " OFF
01300 LEADER   ; WRITES LEADER&SYNCH TO TAPE
01400 OMERR    ; OUT OF MEMORY ERROR
01500 OPENCM   ; OPEN COMMAND POINTER
01600 ORG      ; LOW MEMORY START
01700 FIRST    ; SPACE TO HOLD FORM
01800 MEMSTR   ; FOR M A T I O N *
01900 MESS1    ; BACK TO BASIC
02000 DEFN     ; OPTION
02100 DEFN     ; COPYRIGHT 19B2 DAVID R. GRIGG*
02200 DEFN     ; OAOAH
02300 DEFN     ; OPTIONS*
02400 DEFB     ; OAH
02500 DEFN     ; 1. MODIFY EXISTING FORM
02600 MESS0   ; OAH
02700 DEFN     ; 2. CREATE NEW FORM*
02800 MESS2   ; OAH
02900 DEFN     ; 3. STORE NEWLY-CREATED FORM*
03000 MESS3   ; OAH
03100 DEFN     ; 4. FILL EXISTING FORMS*
03200 MESS4   ; OAH
03300 DEFN     ; 5. RETURN TO BASIC*
03400 MESS5   ; OAH
03500 DEFN     ; INITIALISATION ROUTINE
03600 DEFN     ; SETS UP 'OPEN' COMMAND
03700 BEGIN    ; AS INTRO TO FORMAT
03705 LD       ; (OPENCM),HL
03710 LO       ; HL, LAST
03715 XOR     ; FROM BASIC
03720 LO       ; (HL),A
03725 INC     ; ZEROS LAST BYTE OF PROG
03730 LO       ; AND SPACES BEYOND FOR
03735 LO       ; NEW BASIC START
03740 INC     ; RESET START OF BASIC
03745 LD       ; HL
03750 INC     ; HL, A
03755 LD       ; RESET END OF BASIC
03760 LO       ; RESET ARRAY POINTER
03765 LO       ; RESET FREE SPACE PTR
04200 LO       ; POINT IY TO TABLE
04300 LD       ; (IY+3),A
04400 LD       ; (40F9H),HL
04500 XOR     ; FOR DATA LINES TO
04600 LO       ; (40FBH),HL
04700 JP       ; 32000
04800          ; BACK TO BASIC

04900 NAME    ; NAME FOR TAPE COPY
05000 MESS6  ; IS RECORDER READY
05100 DEFN   ; OOH
05200 OPTION ; SET IX TO TABLE
05300 LD      ; SET IY TO TABLE
05400 CALL   ; CLS
05500 LD      ; HL,MESS1
05600 CALL   ; DISPLAY
05700 TST    ; GET NO OF OPTION CHOSEN
05800 RST    ; EVALUATES NO,
05900 CALL   ; BETVAL
06000 CP      ; VALACC
06100 CP      ; 01H
06200 CP      ; 02H
06300 JP      ; MKFORM
06400 CP      ; CREATE FORM
06500 JP      ; 03H
06600 CP      ; 04H
06700 JP      ; 05H
06800 CP      ; 06CCH ; BACK TO BASIC
06900 JP      ; 04H
07000 JP      ; OPTION
07100 LD      ; ROUTINE STORES SCREEN
07200 SC2MEM ; BC,10240
07300 LO      ; HL,SCREEN
07400 LO      ; DE,MEMSTR
07500 LDIR   ; DE
07600 RET    ; END OF CALLING PROGRAM
07700 LD      ; ROUTINE RETURNS STORED
07800 MEM2SC ; BC,10240
07900 LO      ; HL,SCREEN
08000 LD      ; DE,SCREEN
08100 LOIR   ; RET
08200 LD      ; MEM2SC
08300 LD      ; MKFM02
08400 MODFRM ; CLS
08500 CALL   ; HL,SCREEN
08600 MKFORM ; SET KEY BEING DEPRESSED
08700 MKFM02 ; IS IT A CONTROL CHAR?
08800 LOOP01 ; 32D
08900 TST2   ; M,CONTRL
09000 JP      ; IF LESS THAN 32, CONTROL
09100 CP      ; 91D
09200 JP      ; Z,UPARR
09300 CP      ; 40H
09400 JP      ; 7,ASYMBL
09500 CALL   ; (HL),A
09600 LD      ; DISPLAY CHARACTER ON SCREEN
09700 SKIP01 ; HL
09800 INC    ; ARE WE OVER END OF SCREEN?
09900 CALL   ; TESTH1
10000 JP      ; LOOP01
10100 UPARR  ; REPLACE ; RELACE CHAR COVERED BY CURSOR
10200 LO      ; DE,0040H
10300 A       ; A
10400 XOR    ; MOVE SCREEN POINTER UP ONE LINE

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CALL    WRITE START ADDRESS DF
LD     A,D ; THIS BLCK
CALL    WRITE ; ADD FOR CHECKSUM
ADD    A,E ; ADD FOR CHECKSUM
LD     C,A
CALL    LD, (DE)
22700  LD     A, (DE) ; WRITE THIS BYTE TD TAPE
22800  LOOP42 CALL    WRITE ; ADD FOR CHECKSUM
22900  ADD    A,C ; MAX CHARS IN FIELD
23000  INC     C,A ; IF OVER, GO TD NEXT
23100  LD     DE ; FIELD
23200  INC     DE
23300  DJNZ  LDOP42 ;KEEP GOING
23400  LD     A,C ; WRITE ; WRITE CHECKSUM TD TAPE
23500  CALL    RET
23600  ;DE NOW HAS START OF TABLE
23700  ;DE NOW HAS START OF TABLE
23800  FILL
23900  MEM2SC; GET CLEAN FORM
24000  LD     8,01H ;SET 8 TO FIRST ENTRY FIELD
24100  CALL    GETFLD ;GET SCREEN ADDRESS OF FIELD
24200  LD     A, (HL)
24300  LD     A, (HL) ;SAVE CURRENT CHARACTER
24400  LDOP08 CALL    GETKEY ;GET KEY BEING PRESSED
24500  CP     M,CNTO1 ;IS IT A CONTROL CHAR?
24600  JP     91D ;AN UP ARROW?
24700  CP     Z,UPARO1
24800  JP     96D ;SHIFT ??
24810  JP     Z,CLERO1
24900  LD     (HL),A ;OTHERWISE, PUT CHAR ON SCREEN
25000  INC     C ;C IS NO OF CHARS PUT IN THIS
25100  INC     HL ;ENTRY FIELD SO FAR
25200  LD     A, (IY+1);GET LENGTH OF CURRENT FIELD
25300  CP     C ;HAVE WE EXCEEDED IT?
25400  JP     Z,DNARO2;IF SO, JUMP TD NEXT FIELD
25500  JP     LOOP08
25600  ;DE NOW HAS SCREEN ADDRESS
25700  UPARO1 CALL    REPLACE
25800  UPARO2 DEC    B ;GO BACK TD LAST FIELD
25900  NZ,LOOP10 JP     B, (IX) ;IF BEYOND FIRST FLD, GET LAST.
26000  LD     GETFLD
26100  LDOP10 CALL    LOOP07
26200  JP     Z,CLERO1
26300  INC     DNARO1
26400  DNARO2 CALL    REPLACE
26500  DNARO2 INC     B, (IX) ;GO TD NEXT FIELD
26600  LD     A, (IX) ;ARE WE OVER TOTAL FIELDS?
26700  CP     B, (IX) ;IF SO, SET TD FIRST FIELD.
26800  JP     P,LOOP11
26900  LD     B,01H ;DEC. CHARS SO FAR IN FIELD
27000  LOOP11 CALL    CLEAR
27100  LD     GETFLD
27200  ;DE NOW HAS TABLE START
27300  BKARO1 CALL    REPLACE
27400  DEC     HL ;DECREMENT SCREEN POINTER
27500  DEC     C ;DEC. CHARS SO FAR IN FIELD
27600  JP     NZ,LDOPO8
27700  JP     UPARO2 ;IF BEYOND START DF FLD, GO TD LAST FIELD
27800  ;DE NOW HAS START OF TABLE
27900  FWARO1 CALL    INC     HL ;INC. SCREEN POINTER.
28000  INC     C ;INC CHARS IN FIELD
28100  INC     A, (IY+1);MAX CHARS IN FIELD
28200  LD     C ;IF OVER, GO TD NEXT
28300  CP     M, DNARO1
28400  JP     LDOPO8
28500  JP     Z,CLERO1
28600  ;DE NOW HAS START OF TABLE
28700  GETFLD LD     C,01H ;C HOLDS CHARS SO FAR IN FLD
28800  PUSH   IX
28900  POP    DE
29000  INC     DE
29100  PUSH   BC ;SAVE BC
29200  LDOP12 DEC    B ;B IS INDEX TD FIELD WANTED
29300  JP     Z, THERE ;IF IT'S ZERD, WE'VE REACHED IT.
29400  INC     DE
29500  INC     DE
29600  INC     DE
29700  JR     29800 THERE ;JUMP UP TD NEXT TABLE ENTRY
29800  THERE LD     L,A ;SET HL TD ADDRESS FRDM TABLE
29900  INC     DE
30000  INC     DE
30100  LD     A, (DE) ;DE NOW HAS SCREEN ADDRESS
30200  LD     H,A ;HL NOW HAS SCREEN ADDRESS
30300  INC     DE
30400  LD     A, (DE) ;LENGTH OF FIELD
30500  LD     (IY+1),A ;STDR IN IY+1
30600  POP    BC ;RETURN BC
30700  RET
30800  ;DE NOW HAS SCREEN ADDRESS
30900  ;DE NOW HAS SCREEN ADDRESS
31000  CNTO1 CP     OAH ;IS IT DOWN ARR?
31100  JP     Z, DNARO1
31200  CP     OPH ;IS IT FWD ARROW?
31300  JP     Z, FWARO1
31400  CP     ODH ;IS IT CARRIAGE RETURN?
31500  JP     Z, DNARO1
31600  CP     OEH ;IS IT BACK SPACE?
31700  JP     Z, BKARO1
31800  CP     1FH ;IS IT CLEAR KEY?
31900  JP     Z, CLERO1
32000  CP     1BH ;SHIFT UP ARROW?
32100  JP     Z, OPTION
32200  JP     Z, LDOPO8
32300  ;DE NOW HAS SCREEN ADDRESS
32400  CALL    SC2MEM ;SAVE FORM IN MEMORY
32500  CLEAR CALL    HL,SCREEN ;INITIALISE NO. OF FLDs =0
32600  LD     (IY),00H
32700  LD     IX
32800  PUSH   POP    DE
32900  ;DE NOW HAS SCREEN ADDRESS
33000  ;DE NOW HAS SCREEN ADDRESS

```

```

33100 DEC HL ;ADVANCE SCREEN POINTER
33200 LOOP04 INC CALL
33300 JP NZ, SKIP25 ;AT END OF SCREEN?
33400 LD P, OPTION ;IF SO, DONE, SO RETURN
33500 A, (HL) ;GET CHARACTER ON SCREEN
33600 SFH ;IS IT CURSOR CHAR?
33700 Z, ENTRY ;IS IT, NEW FIELD
33800 LOOP04 JR (IX) ;INCREASE TOTAL ND. FIELDS
33900 ENTRY INC DE
34000 INC LD A,L ;SAVE ADDRESS OF THIS FIELD
34100 LD (DE), A ; IN TABLE
34200 LD (DE), A ; ;
34300 INC DE
34400 LD A,H ; ;
34500 LD (DE), A ; ;
34600 INC DE
34700 LD A,01H ;INITIALISE LENGTH OF FIELD =1
34800 LD (DE), A ; ;
34900 LOOP05 LD A, (DE)
35000 INC CP 240D ;MAX FIELD LENGTH
35100 JP Z,LOOP04 ;IF GREATER, CUT DFF.
35200 LD INC HL
35300 LD INC HL
35400 INC HL
35500 TSTEND ;AT END OF SCREEN?
35600 JP P, OPTION
35700 LD A, (HL)
35800 CP SFH ;ANOTHER CURSOR CHAR?
35900 JP NZ,LOOP04 ;IF NOT, END OF FIELD
36000 JP LOOP05
36100 ; A,H ;HL GREATER THAN 3FFFH?
36200 TSTEND LD A, (41EBH) ; GET CHAR IN BUFFER
36300 CP 40H ;30H; CHANGE ASCII TD NO.
36400 RET
36500 ;
36600 ; A, (41EBH) ; GET CHAR IN BUFFER
36700 VALACC LD BC, AMTDLY; AMOUNT OF DELAY FOR KEYBOARD
36800 SUB 30H ;DEBOUNCE.
36900 RET
37000 ; GETKEY PUSH
37100 LD CALL
37115 LD DELAY ; DEBOUNCE.
37200 A, (HL) ;GET CHAR FROM SCREEN
37300 LD (IY), A ;SAVE IN IY
37400 LP LD (HL), 143D ;PUT BLOCK CURSOR ON SCREEN
37500 LD B, 00H ; ;
37600 LOOP25 CALL GETCHR ;GET KEY DEPRESSED
37700 CP 00H ; IF ZERD, ND KEY DEPRESSED
37800 JP NZ, SKIP25 ;NEED NEW DATA LINE
37900 DJNZ LD 43600 ;IF WE GET HERE, THERE'S ENOUGH ROOM IN LINE
38000 JP 43700 ;DE NOW POINTS TO DATA LINE,
38100 JP 43800 ;LENGTH OF CURRENT FIELD
38200 JP 43900 ;A, (HL) ;GET CHAR FROM SCREEN
38300 JP 44000 ;22H ;QUOTEST?
38400 JP NZ, SKIP26 ;UP ARROW INSTEAD
38500 JP SKIP31 ;DOWN ARROW INSTEAD
38600 JP 3AH ;COLON?
38700 LD A, (IY) ;RETURN CHARACTER.
38800 LD (HL), A ;DISPLAY IT
38900 LD B, 00H ;FORWARD ARROW INSTEAD
39000 CALL GETCHR ;GET KEY DEPRESSED
39100 CP 44100 ;A, SCH
39200 JP 44200 ;SKIP31
39300 JP 44300 ;3AH ;COLON?
39400 JP NZ, SKIP30 ;FORWARD ARROW INSTEAD
39500 JP 44400 ;A, SEH
39600 SKIP25 ;REPEAT 256 TIMES
39700 RET ;WE'VE GOT A CHARACTER, SO RETURN
39800 ; REPLACE
39900 CALL CLERO1 LD B, 01H
40000 LOOP13 LD A, 0BH
40100 LD (IY+4), A ;INITIALISE LENGTH OF DATA LINE
40200 LD HL, (ENDPRG) ;CURRENT END OF PROGRAM PTR
40300 LD DE, (40B1H) ;MEMORY SIZE
40400 XOR A
40500 PUSH SBC HL, DE ;ARE WE OUT OF MEMORY?
40600 POP JP HL, DE ;ARE WE OUT OF MEMORY?
40700 LD E, (IY+2) ;GET NEW LINE NO.
40800 LD D, (IY+3) ;FOR DATA LINE
40900 LD E, (IY+2) ;GET NEW LINE NO.
41000 LD D, (IY+3) ;FOR DATA LINE
41100 INC INC INC DE
41200 INC INC INC DE
41300 INC INC INC DE
41400 INC INC INC DE
41500 INC INC INC DE
41600 LD (IY+2), E ;INCREMENT IT BY 5
41700 LD (IY+3), D ;STORE IT FOR NEXT TIME
41800 LD (HL), E ;PUT IT IN DATA LINE
41900 INC INC HL
42000 LD (HL), D ;LINE NO. NOW IN PLACE
42100 INC INC HL
42200 LD (HL), 136D ;DATA TOKEN
42300 INC HL
42400 LD (HL), 32 ;SPACE
42500 INC HL
42600 PUSH GETFLD ;GET ADDRESS OF FIELD.
42700 CALL DE ;DE NOW POINTS TO DATA LINE,
42800 POP C, (IY+1) ;LENGTH OF CURRENT FIELD
42900 LD A, (IY+4) ;LENGTH OF LINE SO FAR
43000 LD A,C ;C, ENDLINE ;NEED NEW DATA LINE
43100 ADD JP C, ENDLINE ;C, ENDLINE
43200 JP DE ;DE NOW POINTS TO DATA LINE,
43300 LD C, (IY+1) ;LENGTH OF CURRENT FIELD
43400 LOOP14 LD A, (HL) ;GET CHAR FROM SCREEN
43500 CP 2CH ;COMMA?
43600 JP NZ, SKIP28 ;UP ARROW INSTEAD
43700 LD A, 5BH ;SKIP31
43800 JP 2CH ;COMMA?
43900 SKIP28 CP NZ, SKIP29
44000 JP NZ, SKIP29 ;DOWN ARROW INSTEAD
44100 LD SKIP31
44200 JP 3AH ;COLON?
44300 SKIP29 CP NZ, SKIP30
44400 JP A, SEH ;FORWARD ARROW INSTEAD
44500 LD

```

```

44600 JP SKIP31 ; ENTRY FIELD (CURSOR)?
44700 SKIP30 CP
44800 JP Z, SKIP32 ; IF SO, NO MORE DATA IN FIELD
44805 SKIP31 DEC C ; C HAS ND. OF PLACES IN FIELD
44810 JP Z, SKIP32 ; IF ZERO, AT END OF FIELD
        LD (DE),A ; LOAD CHAR INTD DATA LINE
        DE HL
        INC INC (IY+4)
45200 JP LDOP14 ; DD IT AGAIN
45205 LD A,2CH ; INSERT COMMA
        DE (DE),A
        DE HL
45500 SKIP32 LD INC (IY+4)
45600 INC INC 8 ; NEXT FIELD
46000 PUSH DE
46100 LD A, (IX) ; ARE WE AT END OF
46200 CP 8 ; FIELDS?
46300 JP P,LOOP15 ; IF NOT, GET NEXT
46400 POP DE
46500 ENDLINE XOR A
46600 ENDLINE DEC DE ; END OF LINE ZERO DVER LAST COMMA
46700 LD (DE),A
46800 INC DE
46900 LD (DE),A
47000 INC DE
47100 LD (DE),A
47200 INC DE ; NOW AT NEW VARIABLE START
47300 INC LD HL,(ENDPRB) ; GET OLD VARIABLE START
47400 PUSH HL ; SAVE THIS POSITION
47500 LD HL,ENDPRG
47600 LD (HL),E
47700 LD (HL),D ; RESET ENDPRG TD NEW POSITION
47800 INC POP HL ; OLD VAR START IS SPDT
47900 LD DEC HL ; FOR NEW LINE POINTER
48000 POP DEC HL
48100 DEC DE
48200 DEC DE
48300 DEC DE
48400 DEC LD (HL),E ; RESET LINE PTRINTER
48500 INC HL
48600 LD (HL),D ; TOTAL NO OF FIELDS
48700 LD A,(IX) ; ARE WE FINISHED?
48800 CP 8
48900 JP F,LOOP13 ; NO, SO CONTINUE
        JP FILL
49000
49100 JP
49200 YTAB 10H ; TABLE FOR DDD VARIABLES
49300 XTAB 0000H ; LOOKUP TABLE FOR ENTRY FIELDS
49400 DEFW 0000H
49500 DEFW 252D
49600 DEFNS
49700 LAST NOP
49800 BEGIN END

```

4A0F:	DD E5 D1 13 C5 05 CA 1D 4A 13 13 18 F7 1A 6F
4A1F:	1 3 1A 67 13 1A FD 77 01 C1 C9 FE 0A CA E0 49 FE
4A2F:	0 9 CA FE 49 FE 0D CA E0 49 FE 08 CA F3 49 FE 1F
4A3F:	CA 7C 4A FE 1B CA 3B 48 CA 1B CA 3B 48 CA 1B 49
4A4F:	4B 21 00 3C DD 36 00 00 DD E5 D1 2B 23 CD 8F 4A
4A5F:	F2 3B 4B 7E FE 5F CA 6A 4A 18 F1 DD 34 00 13 7D
4A6F:	12 13 7C 12 13 3E 01 12 1A 3C FE F0 CA 5B 4A 12
4A7F:	23 CD 8F 4A F2 3B 4B 7E FE 5F C2 5B 4A C3 77 4A
4A8F:	7C FE 4C 9C 3A EB 41 D6 30 C9 C5 01 00 13 CD 60
4A9F:	07 FE FD 77 00 36 8F 06 00 CD 28 00 FE 00 C2 C5
4AAF:	4A 10 F6 C3 A4 4A C1 C9 CD DD 4B 06 01 3E 08 FD
4ABF:	77 04 2A F9 40 ED 5B 81 40 AF E5 ED 52 F2 A7 19
4ACF:	E1 FD 5E 02 FD 56 03 13 13 13 FD 73 02 FD
4ADF:	72 03 73 23 72 23 36 8B 23 36 20 23 E5 CD 0D 1A
4AEF:	D1 FD 4E 01 FD 7E 04 81 DA 4D 7E FE 2D C2 1F 4B
4AFF:	4B 3A 5B C3 2B 4B FE 2C C2 1F 4B 3E 5C C3 2E 4B
4B0F:	FE 3A 5C 2B 29 4B 3E 5C C3 2E 4B FE 5F CA 3B 4B 0D
4B2F:	CA 3B 4B 12 13 23 FD 34 04 C3 0A 4B 3E 2C 12 13
4B3F:	23 FD 34 04 04 D5 DD 7E 00 B8 F2 FC 4A D1 AF 18
4B4F:	12 13 12 13 12 13 2A F9 40 E5 21 F9 40 73 23 72
4B5F:	E1 2B 2B 18 18 73 23 72 DD 7E 00 B8 F2 CC 4A C3
4B6F:	A5 49 20 08 0F 7D 20 52 45 43 49 3C 02 0C 3D 1F 8C
4B7F:	46 08 09 88 3C 15 A7 3C 02 A9 3C 02 0C 3D 1F 8C
4B8F:	3D 1F 0C 3E 1F 8C 3E 1F OC 3F 05 8C 3F 0D 33 45
4B9F:	54 20 54 4F 20 42 4F 55 4E 44 41 52 49 45 53 20
4B9AF:	4F 46 20 50 52 4F 47 52 41 4D 18 47 06 09 58 4F
4B8BF:	52 09 41 7C 47 1F 09 53 42 43 09 4B 4C 2C 44 45
4B8CF:	09 3B 4E 4F 20 4F 46 20 42 59 54 45 AB 4B 09 09 4C
4BDF:	20 4D 4F 36 45 EO 47 07 09 49 4E 43 09 4B 4C 44
4B9EF:	48 26 09 43 41 4C 09 4C 45 44 45 52 20 26 20 53 59
4BFF:	52 49 54 45 20 4C 45 41 44 45 52 20 26 20 53 59
4C0F:	4E 43 4B 20 42 59 54 45 AB 4B 09 09 4C 44 09 41
4C1F:	2C 35 35 4B 0C 49 08 09 43 41 4C 09 57 52 49
4C2F:	54 45 70 55 53 4B 09 09 4C 44 09 42 2B 30 36 48 D4
4C3F:	08 09 50 55 53 4B 09 09 4C 38 4A 25 07 4C 44 09
4C4F:	4B 4C 2C 4E 41 4D 45 09 3B 50 52 4F 47 52 41 4D
4C5F:	20 4E 41 4D 45 20 49 53 20 27 46 4F 52 4D 41 54
4C6F:	27 9C 4A 10 4C 4F 50 34 30 09 4C 44 09 41
4C7F:	2B 4B 00

```

    TRS-80/SYSTEM-80

 495F: 64 02 CD 8C 47 18 EE AF 7D 01 C3 3B 4B 02 01 F7 47 79      10 ^ P R 1 O R 1 T 1 E S
 496F: 7D CD 64 02 CD BC 49 3E 78 CD 64 02 CD 80 01 F7 47 78      20 ^AFJ Bell 20/06/81
 497F: CD 64 02 78 CD 64 02 CD 78 01 C3 3B 4B 02 01 F7 47 78      30 ^AFJ Hyde Park Rd, TRARALGON, 3B44
 498F: 64 02 7A CD 64 02 B3 4F 1A CD 64 02 B1 4F 13 10      40 Uses 5.3 KBytes including ULCBAS
 499F: F7 79 CD 64 02 C9 CD 78 4B 06 01 CD 0D 4A 7E FD      50 DLS:1F PEEK(14312)<>63 THEN PRINT "Lineprinter no
   :      70 LPRINT CHR$(27);CHR$(66):POKE 16424,72:POKE 16424
   :      70 CLEAR 1000:DEFINT A-Z

```

```

80 DIM SD$(12,3),HEAD$(4),PU$(3),OPTN$(9),I(12)
90 FOR L=0 TO 4:READ HEAD$(L):NEXT 'Sets headings etc
100 DATA PRIORITIES,RAW data,by Importance,by Priority
110 FOR L=0 TO 3:READ PU$(L):NEXT
120 DATA "Z"
130 CLS 'Sets & displays options
140 FOR L=1 TO 9:READ OPTN$(L):NEXT
150 DATA Display Instructions,Order Data,Echo Data
160 DATA Add Line(s),Change Line
170 DATA Order by Importance,Order by Feasibility
180 DATA Order by Priority, End
190 CLS:PRINT:PRINT CHR$(23) TAB(12)"Options":PRINT
200 FOR L=1 TO 9:PRINT L;" ";OPTN$(L):NEXT
210 PRINT:PRINT"What is your choice ?"
220 IF 0$<"1" OR 0$>"9" GOTO 220
230 IF 0$<"1" OR 0$>"9" GOTO 220 ELSE OPTN=VAL(0$)
240 ON OPTN GOTO 250,310,450,470,480,580,610,640,670
250 CLS:PRINT:PRINT CHR$(23)
260 PRINT" This program will help to dec-";CHR$(13);ide the relative priorities of";CHR$(13);Instructions
270 PRINT" Please enter data as prompted.";CHR$(13);various activities."
280 PRINT" If the";CHR$(13);cursor is showing. If a mistake";CHR$(13);is made when entering data then";CHR$(13);enter XXX as a activity name. To"
280 PRINT"Finish entering data enter ZZZ ";CHR$(13);as activity name."
290 PRINT:PRINT"Press any key when ready"
300 IF R$=INKEY$:IF R$="X" GOTO300 ELSE GOTO 190
310 CLS:PRINT CHR$(23) 'Accepts data
320 GOTO 980
330 N=N+1:I(N)=N:IF N>12 PRINT"No more space":FOR L=1 TO 500:NEXT T:GOTO 190
340 INPUT"Activity name ";A$:SD$(I(N),0)=LEFT$(A$,25)
350 IF SD$(I(N),0)="XXX" THEN N=N-1:PRINT"Rewrite entry":GOTO 340
360 IF SD$(I(N),0)="ZZZ" THEN N=N-1:GOTO 190
370 PRINT"Importance ? ";I$=INKEY$:IF I$="" GOTO 380
390 IF I$<"1" OR I$>"9" GOTO 380 ELSE PRINT I$:SD$(I(N),1)=I$0
400 PRINT"Feasibility ? ";F$=INKEY$:IF F$="" GOTO 410
410 IF F$<"1" OR F$>"9" GOTO 410 ELSE PRINT F$:SD$(I(N),2)=F$
430 SD$(I(N),3)=STR$(VAL(SD$(I(N),1)) * VAL(SD$(I(N),2)))
440 PRINT:GOTO 330
450 CLS 'Echoes data
460 H=1:GOSUB 680:GOSUB 650:GOTO 190
470 CLS:PRINT CHR$(23) "Add more line(s)":GOTO 330
480 CLS:PRINTCHR$(23) "Which line will you change":INPUT C
490 INPUT"Activity name ";B0$(I(C),0)
500 PRINT"Importance ? ";I$=INKEY$:IF I$="" GOTO 510
520 IF I$<"1" OR I$>"9" GOTO 510 ELSE PRINT I$:SD$(I(C),1)=I$0
530 PRINT"Feasibility ? ";F$=INKEY$:IF F$="" GOTO 540
540 IF F$=INKEY$:IF F$="" GOTO 540
550 IF F$<"1" OR F$>"9" GOTO 540 ELSE PRINT F$:SD$(I(C),2)=F$
560 SD$(I(C),3)=STR$(VAL(SD$(I(C),1)) * VAL(SD$(I(C),2)))
570 GOTO 190
580 T=1:H=2
590 PRINT# 960,"Ordering by importance...";I$=VAL(SD$(I(C),1))
600 GOSUB 770:GOTO 190
610 T=2:H=3
620 PRINT# 960,"Ordering by feasibility...";I$=VAL(SD$(I(C),2))
630 GOSUB 770:GOTO 190
640 T=3:H=4
650 PRINT# 960,"Ordering by priority...";I$=VAL(SD$(I(C),3))
660 GOSUB 770:GOTO 190
670 CLS:PRINT"Goodbye":GOSUB 950:END
680 CLS:TITLE$=HEAD$(0)+" "+HEAD$(H) 'Display subroutine
690 PRINT TAB(32-LEN(TITLE$)/2) TITLE$:PRINT
700 PRINT" Activity";TAB(35)"Imp Fsb Pri"
710 FOR L=1 TO N
720 PRINT USING PU$(L);STR$(I(L));
730 FOR J=0 TO 3
740 PRINT USING PU$(J);SD$(I(L),J);
750 NEXT J:PRINT
760 NEXT L:RETURN
770 FOR K=1 TO N-1 'Secondary index Bubble "Sort" & Display
780 F=0
790 FOR J=1 TO N-K
800 IF VAL(SD$(I(J),T)) >= VAL(SD$(I(J+1),T)) GOTO 820
810 F=1:X=I(J):I(J)=I(J+1):I(J+1)=X
820 NEXT J:IF F=0 GOTO 840
830 NEXT K
840 GOSUB 680:GOSUB 850:RETURN
850 PRINT# 960,"Press C to copy, 0 for options";'Screenprint subroutine
860 R$=INKEY$:IF R$="" GOTO 860
870 IF R$="0" GOTO 190 ELSE IF R$="C" GOTO 880 ELSE GOTO 860
880 V=15360
890 FOR R=0 TO 14
900 FOR C=0 TO 63
910 LPRINT CHR$(PEEK(V+64*R+C));
920 NEXT C,R:LPRINT" ";LN=LN+16:POKE 16425,LN
930 IF LN>64 GOSUB 950
940 RETURN
950 IF PEEK(16425)<70 THEN LPRINT" ";GOTO 950 'Pagination subroutine
960 CLS:PRINT:PRINT"Please tear off page, then press any key"
970 R$=INKEY$:IF R$="" GOTO 970 ELSE POKE 16425,1:LN=0:RETURN
980 CLS:INPUT"N = ";N 'Test data subroutine
990 FOR L=1 TO N
1000 I(L)=L
1010 N=RND(26):SD$(I(L),0)=STRING$(15,CHR$(NO+64))
1020 N1=RND(9):SD$(I(L),1)=STR$(N1)
1030 N2=RND(9):SD$(I(L),2)=STR$(N2)
1040 SD$(I(L),3)=STR$(N1*N2)
1050 NEXT:GOTO 190

```

***** NEXT MONTH'S ISSUE *****

Next month's issue will contain at least the following programs plus the usual features and articles. An (80) after a program title indicates that the program will be for TRS-80 Model 1/3 or System 80/Video Genie. A (CC) indicates that the program will be for the TRS-80 Colour Computer and (Peach) that the program is for the Hitachi Peach.

**** HAMBURGER (80) L2/16K ****

It is your job to make hamburgers. You have got some buns, eggs, salad and meat. The only trouble is that while you are trying to put the hamburgers together, a couple of aggressive sausages are trying to catch you. The bigger the hamburger, the bigger your score.

**** XUSR SCREEN FILL SUBROUTINE (80) L2/4K ****

This very short but powerful subroutine gives you a new function that you can use within your own programs. With this program you can insert X=USR(N) where N is a number from 1 to 255 and the screen will fill with that character at machine language speed.

**** WORLD CHAMPIONSHIP BOXING (CC) ****

If you ever felt like a punch-up with your computer, now's your chance. The computer controls one of the boxers and you control the other. If you don't want to get knocked out you better keep on the move - the computer will show no mercy!!

**** OTHELLO (HP) ****

This is the same game, (different program and author though), as the one that appeared last issue for the Colour Computer. The game is played on an 8 x 8 board and you must outflank your opponent to flip his playing pieces to your colour.

**** HIGH RESOLUTION SCREEN SCORE SUBROUTINE (CC) ****

This subroutine can be added to any basic program that requires a score display on a high resolution screen. The size of the score numbers and their position can easily be changed to suit your needs - all that has to be done to use the subroutine is to use the variable SC to contain your score and then call the subroutine.

**** SYSTEM TAPE MAKER (80) L2/16K ****

Just for the Level 2 users, this utility gives your machine the ability to save any block of memory to tape, either from a BASIC program or from the command mode. All you have to do is type - SAVE name addr1 addr2 addr3. Where name is a six digit name, addr1 is the start address, addr2 is the end address and addr3 is the optional entry point.

**** BLOCK GAME (HP) ****

This is a two player game in which each player controls a graphic line within a confined area. As each player's line moves, it gets longer and longer. You must try to force your opponent to run into the border - himself or you. The first player to hit something is the loser.

**APPLICATION FOR PUBLICATION
OF A PROGRAM
IN MICRO-80**

Date

To MICRO-80
SOFTWARE DEPT.,
P.O. BOX 145,
MORPHETT VALE, S.A. 5162

Please consider the enclosed program for publication in MICRO-80.

Name

Address

Postcode

***** CHECK LIST *****

Please ensure that the cassette or disk is clearly marked with your name and address, program name(s), Memory size, Level I, II, System 1 or 2, Editasm, System, etc. The use of REM statements with your name and address is suggested, in case the program becomes separated from the accompanying literature.

Ensure that you supply adequate instructions, notes on what the program does and how it does it, etc.

For system tapes, the start, end, and entry points, etc.

The changes or improvements that you think may improve it.

Please package securely - padded bags are suggested - and enclose stamps or postage if you want your cassette or disk returned.

***** CASSETTE/DISK EDITION INDEX *****

The cassette edition of MICRO-80 contains all the applicable software listed each month, on cassette. For machine language programs copies of both the source and object file are provided. All programs are recorded twice. Level 1 programs can only be loaded into a Level 2 machine if the 'Level 1 in Level 2' program from the MICRO-80 Software Library - Vol. 1 is loaded first.

Note: System 80/Video Genie computers have had different tape-counters fitted at different times. The approximate start positions shown are correct for the very early System 80 without the volume control or level meter. They are probably incorrect for later machines. The rates for a cassette subscription are printed on the inside front cover of each issue of the magazine.

The disk edition contains all applicable programs which can be executed from disk. Level I disk programs are saved in NEWDOS format. Users require the Level I/CMD utility supplied with NEWDOS+ or NEWDOS 80 version 1.0 to run them.

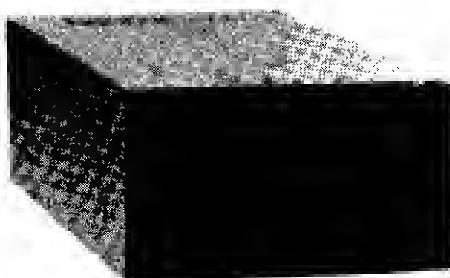
<u>SIDE 1</u>	<u>TYPE</u>	<u>I.D.</u>	<u>DISK FILESPEC</u>	<u>APPROX. CTR-41</u>	<u>START CTR-80</u>	<u>POSITION SYSTEM 80</u>
PRIORITIES "	L2/16K "	P "	PRIOR/BAS "	18 63	10 35	5 17
DESERT CHASE "	L2/16K "	D "	DESERT/BAS "	105 184	58 103	30 58
FORMATION "	SYSTEM "	FORMAT "	FRMATION/CMD "	257 281	144 157	84 92
FORMATION	EDTASM	FORMAT	FRMATION/EOT	304	170	103
<u>SIDE 2</u>						
FORMATION	EDTASM	FORMAT	FRMATION/EDT	18	10	5
OTHELLO "	COCO "	O "	- -	170 193	95 108	- -
TOWER OF HANOI "	COCO "	T "	- -	21S 237	120 133	- -
TOWER OF HANOI "	HITACHI "	TOWERS "	- -	261 323	146 181	- -
REGISTER DISPLAY "	HITACHI "	REG/BAS "	- -	330 391	213 219	- -

The MICRO-80 PRODUCTS listed below

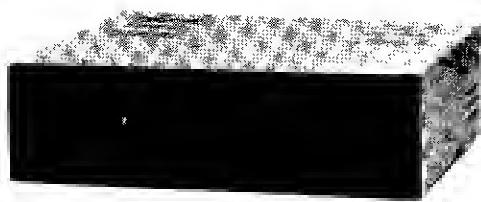
**MICRO-80, P.O. BOX 213, GOODWOOD
SOUTH AUSTRALIA. 5034.**



SAVE A PACKET ON MICRO-80's DISK DRIVE PACKAGES FOR TRS-80 MODEL 1 AND SYSTEM 80 MICROCOMPUTERS



SINGLE DRIVE PACKAGE from ... \$499



DUAL DRIVE PACKAGE from ... \$874

Bigger volume means lower cost price, which we are passing on to you. Avoid the annoying bundle of cables, wires and separate boxes. MICRO-80 is now offering our well-proven MPI disk drives in attractive, self-contained single or dual-drive cabinets complete with internal power supply. Our drive Ø and dual-drive packages also include the appropriate version of DOSPLUS and dual-drive cable.

*The best news of all is the specially reduced package prices ...
SAVE \$23 — \$107 over our already low prices!*

Choose the appropriate system from the table below:

DRIVE TYPE	No. of Tracks	No. of Heads	Capacity	Dosplus Version	Price	* Saving
DRIVE Ø						
1 x MPI B51	40	1	100K	3.4	\$499	\$137.95
1 x MPI B52	40	2	200K	3.4	\$639	\$97.95
1 x MPI B92	80	2	400K	3.4	\$799	\$107.95
DRIVE 1						
1 x MPI B51	40	1	100K	—	\$415	\$33.00
1 x MPI B52	40	2	200K	—	\$525	\$23.00
1 x MPI B92	80	2	400K	—	\$695	\$23.00

*Represents the saving compared with buying all the items included in the package separately

•Drive Ø package includes one bare disk drive, self-contained single-drive cabinet/power supply as illustrated, two drive cable and the version of DOSPLUS indicated.

•Drive 1 package includes one bare disk drive and self-contained single-drive cabinet/power supply as illustrated.

*If it's a dual-drive system you need, then take advantage of our dual-drive package and
SAVE a further \$40 on the price of two single-drive packages ...*

DRIVE TYPE	No. of Tracks	No. of Heads	Capacity	Dosplus Version	Price
2 x MPI B51	40 ea	1 ea	2 x 100K	3.4	\$874
2 x MPI B52	40 ea	2 ea	2 x 200K	3.4	\$1125
2 x MPI B92	80 ea	2 ea	2 x 400K	3.4	\$1454

Dual-drive package includes two bare disk drives, self-contained dual-drive cabinet/power supply as illustrated, two drive cables and the version of Dosplus indicated.

NOTE: All 40 track drives are completely compatible with 35 track operating systems such as TRSDOS. DOSPLUS5 allows you to realise an additional 14% capacity compared with TRSDOS. Under DOSPLUS 3.4, 80 track drives can read 35/40 track diskettes.

All disk drive components are still available separately:

BARE DRIVES — MPI drives offer the fastest track-to-track access time (5 milliseconds) available. All drives are capable of operating in double density for 80% greater storage capacity.

	Price	Freight		Price
MPI B51 40 track, single-head, 100K	\$349	\$5.00	Self-contained, single drive cabinet/power supply	\$99 \$5.00
MPI B52 40 track, dual-head, 200K	\$449	\$5.00	Self-contained, dual-drive cabinet/power supply	\$135 \$5.00
MPI B92 80 track, dual-head, 400K	\$619	\$5.00	Two drive cable	\$39 \$2.00
Separate, dual-drive power supply	\$85	\$8.00	Four drive cable	\$49 \$2.00
			DOSPLUS 3.4	\$149.95 \$2.00

Prices are FOB Adelaide. Add \$5.00 freight for single drive package, \$10.00 for dual-drive package. Prices are in Australian dollars. Freight is road freight anywhere in Australia.

All items carry a 90-day parts and labour warranty. Repairs to be carried out in our Adelaide workshops.

MICRO-80

LEVEL 2 ROM

ASSEMBLY LANGUAGE TOOLKIT

by Edwin Paay

FOR TRS-80 MODEL 1, MODEL 3 AND SYSTEM 80/VIDEO GENIE

This is a new package consisting of two invaluable components:

- **A ROM REFERENCE** Manual which catalogues, describes and cross-references the useful and usable ROM routines which you can incorporate into your own machine language or BASIC programs.
- **DEBUG**, a machine language disassembling debugging program to speed up the development of your own machine language programs. DEBUG is distributed on a cassette and may be used from disk or cassette.

Part 1 of the ROM REFERENCE manual gives detailed explanations of the processes used for arithmetical calculations, logical operations, data movements etc. It also describes the various formats used for BASIC, System and Editor/Assembly tapes. There is a special section devoted to those additional routines in the TRS-80 Model 3 ROM. This is the first time this information has been made available, anywhere. Differences between the System 80/Video Genie are also described. Part 1 is organised into subject specific tables so that you can quickly locate all the routines to carry out a given function and then choose the one which meets your requirements.

Part 2 gives detailed information about each of the routines in the order in which they appear in the ROM. It describes their functions, explains how to use them in your own machine language programs and notes the effect of each on the various Z80 registers.

Part 2 also details the contents of system RAM and shows you how to intercept BASIC routines. With this knowledge, you can add your own commands to BASIC, for instance, or position BASIC programs in high memory — the only restriction is your own imagination!

The Appendices contain sample programmes which show you how you can use the ROM routines to speed up your machine language programs and reduce the amount of code you need to write.

DEBUG: Eddy Paay was not satisfied with any of the commercially available debugging programs, so he developed his own. DEBUG: allows you to single-step through your program; has a disassembler which disassembles the next instruction before executing it or allows you to bypass execution and pass on through the program, disassembling as you go; displays/edits memory in Hex or ASCII; allows Register editing; has the ability to read and write System tapes and all this on the bottom 3 lines of your screen, thus freeing the rest of the screen for program displays. Four versions of DEBUG are included in the package to cope with different memory sizes.

The best news of all is the price. The complete Level 2 ROM ASSEMBLY LANGUAGE TOOLKIT is only:

- Aus. \$29.95 + \$2.00 p&p
- UK £18.00 + £1.00 p&p

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